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WILLEBRORDI SNELLI
A ROYEN, R. F.

DOCTRINÆ

TRIANGVLORVM

CANONICÆ

LIBRI QVATVOR,

Quibus CANONIS *ſinuum, Tangentium, & ſecantium conſtructio,*

TRIANGVLORVM tam PLANORVM quam SPHÆRICORVM expedita dimenſio,

breviter ac perſpicuè traditur:

Poſt mortem Autoris in lucem editi à MARTINO HORTENSIO Delfenſi;

Qui iſtis Problematum Geodæticorum & Sphæricorum tractatus ſingulos adjunxit, quibus præcipuarum utriuſque Trigonometriæ propoſitionum uſus declaratur.

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BIBLIOTECA NAZ. ROMA VITTORIO EMANUELE

LVGDVNI BATAVORVM,
Ex officinâ IOANNIS MAIRE.
cIↄ Iↄ c XXVII.

Illuſtriſsimis Potentiſsimis

DD. ORDINIBVS
HOLLANDIÆ & WEST-FRISIÆ.

Ampliſſimis Prudentiſsimiſque

DD. PRÆTORIBVS, CONSVLIBVS, SYNDICIS inclitarum Rerumpublicarum

DORDRACENÆ, DELFENSIS, ALCMARIANÆ,

Studiorum Mathematicorum patronis ſummis.

Illuſtriſsimi, Potentiſsimi, Prudentiſsimi Domini

INTER omnes Mathematicæ ſcientiæ partes, quæ variæ ſanè ſunt ac vaſtæ, nulla æquè jus primum & prærogativam tenet ac Geometria: & huius quidem membra cum duo ſint, Dimenſio ſcilicet Planorum & Solidorum, utraque comprehendit ac menſuræ certæ ſubiicit, quicquid ullibi in toto Mundo corporeum ac ſenſibus expoſitum: ſive enim Cœlum ſcandimus & æternas nobiliſsimorum corporum periodos, vagas atque in multiplici errore conſtantes tamen motuum leges mente percurrimus: ſive Terram domicilium noſtrum, & in eâ omnium rerum pulcherrimum ſtatum ac ordinem intuemur, ubique illud divini Plato-

BIBLIOTECA NAZ. ROMA VITTORIO EMANUELE

nis divinum ἀκρόαμα; τὸν θεὸν πάντων μάλιςα γεωμετρεῖν in totâ rerum naturâ luculenter deprehendimus. Nec tam Geometria reliquas partes nobilitate antecellit, quin etiam in ſingulis eluceat adeò oportunus illius uſus, ut ſine eâ conſiſtere nequeant; & ut ex ungue leonem, unica *Triangulorum doctrina* quibus non modis iiſdem ancillatur? hæc mihi Aſtronomiam, Geographiam, Geodæſiam, Architectonicam militarem, Opticam, non tantum ut baſis ac fundamentum ſuſtinet, verum etiam planè perficit àc conſummat; Aſtronomiæ quidem una pars quæ *doctrina primi mobilis* vulgò dicitur, nonne tota pendet à calculo tripleurorum ſphæricorum? quibus vera aſtrorum loca, commodis inſtructi organis inquirimus, eorumque ortus, occaſus, arcus diurnos, nocturnos, aſcenſiones & deſcenſiones, omni loco & tempore ob oculos ponimus? altera verò quæ *doctrinæ theoricæ* nomine venit, & circà Planetarum verſatur motus, nunquid beneficio Triangulorum planorum conſtituitur? ſagax enim humana mens, cum nullo modo tantam motuum varietatem comprehendere poſsit, nedum in futurum prædicere; auxiliares ab hac noſtrâ Trigonometriâ petens copias, eouſque cœleſtem illam arcem oppugnat, ut ſuppoſitis quibuſdam hypotheſibus eam tantum non expugnet, verum etiam ita ſibi ſubiiciat, ut ejus meatus & anfractus varios, omnemque ſupellectilem inſpiciat, & in

omne

omne ſeculum poſteritati annumerare ſciat quid in ea quovis tempore futurum ſit, quæ ſtationes, regreſsiones, ſyzygiæ, quis corporum ſitus ac motus, quæve præcipuarum partium σχήματα καὶ διαστήματα, auſa hoc pacto tentare *rem* ut ait Plinius, *etiam Deo improbam*.

Nec minus Geographiæ principia ſua noſtra doctrina ſuppeditat; hæc enim rationem Æquatoris ad Parallelos, Climatum latitudines & incrementa, umbrarum rationes, locorum quorumcunque diſtantias, terrarum deſcriptiones, accuratè tradit; hæc Nauticam Geographiæ animam per ſe infirmam ſuſtentat, dum Loxodromiarum affectiones & intricatas rationes planas facit, naviumque quibus tot quotidiè divitiæ tam vaſto Oceano committuntur, directiones ſecurè adminiſtrare edocet.

In Geodæſiâ verò, qualecunque tandem agrorum dimetiendorum munus incumbit, id omne Trigonometria planorum, adminiculo Tabularum Canonicarum facillimè expedit: Tabulæ Chorographicæ delineandæ ſunt? hæc diſtantias locorum ſuppeditat; turrium, montium, ædificiorum altitudo requiritur? ad Triangulum itur; hi gradus, hæ ſcalæ, quibus rem alioqui per ſe inacceſſam conſcendimus: antiquiſsimum illud Radij inſtrumentum, quo facillimo calculo Geometræ terras, maria, flumina, Cælique meatus deſcribunt, nonne meris triangulis rectangulis

conſtat? ut vel hinc jure meritò dicatur *Triangulum Rectangulum Magiſter eſt Matheſeos*: miraculo fuit Thales Mileſius quod altitudinem Pyramidum Ægyptiarum per umbram deprehenderit, obſervato tempore quando umbræ corporibus pares ſunt; at nunc eadem praxis facta eſt expeditior, ut quamvis nubilo cœlo, tamen hoc vel alio inſtrumento exerceri poſsit per ſimilitudinem angulorum & laterum proportionem.

Quid in re Militari? an non Caſtrorum metationes, Tormentorum directiones, Munitiones urbium & oppugnationes hac Triangulorum planorum Mechanice abſolvuntur? certe nullus hodie Architectus tam temerarius, qui caſtra militiamque ſequatur, & non modico ſaltem tabularum Canonicarum inſtructus ſit uſu; quanquam non ignorem reperiri quoſdam qui non hanc ſolum partem, verùm etiam intima Geometriæ adyta penetrarunt, adeo neceſſariam rebus ſuis eam iudicantes.

Denique nobiliſsima Opticæ ſcientia, quæ circà Viſum, Lucem, Umbram, & Colores verſatur, planè nulla eſt ſine hac Doctrinâ; hæc enim quantitatem reflexionum ac refractionum Lucis in ſpeculis & corporibus pellucidis metitur, diverſitatem umbræ imaginiſve rei explicat, & mirabiles illas ſpecierum apparentias in politis ſuperficiebus corporum, aut tollere docet aut efficere; hæc mortalium

animos

animos ſubducit in cœlum, & beneficio umbrarum Telluris & Lunæ, trium maximarum rerum naturæ partium magnitudinem, umbræque ipſius extenſionem in longum & latum detegit.

Cum ergo tanta ſit huius doctrinæ utilitas *Illuſtriſſimi Ordines, Prudentiſſimi Conſules*, quid mirum ſi indè ab ultimâ antiquitate præſtantiſſimi Mathematici eam adeò ſedulò excoluerint, ſemperque ei nova acceſſio facta ſit? multa equidem ac præclara inventa Hipparchi, Menelai, Ptolemæi, ſummorum virorum, ſed quibus inde à reſtauratione harum diſciplinarum, Recentiorum indefeſſum ſtudium ac improbus labor longè utiliſſima ac facillima adiecit: poſtquam enim in poſſeſsionem artis venere Germani, primus Ioh. Regiomontanus ignei vir ingenii, univerſalem Trigonometriam in unum corpus redegit, facilitatem calculi abacis induxit, omnem diviſionis moleſtiam ubicunque ſinus totus eſt primo loco declinans: poſt hunc Georg. Ioachimus Rheticus in vaſto illo opere Palatino ſummam manum eidem impoſuiſſe videri poterat, conditis tabulis ad ſinum totum decem circulorum, & ad dena ſcrupula ſecunda; ſed quid poſt eum Clavius, Finckius, Pitiſcus, aliique præſtiterint, facile iudicare poſſunt ii qui operibus eorum legendis ſeriam adhibuerunt operam. Itali verò neminem ſuo Maurolyco Maginoque præferent, ſicut nec Galli ma-

gno ſuo Vietæ: ſubtilia ſunt eorum inventa & commodus uſus: ſed quid de Belgis? impius ſim in patriam ſi non & horum induſtriæ meminero: Ingenioſiſſimus Adrianus Romanus fundamenta tabularum Canonicarum ſolida iecit, erutis & vaſtiſsimis numeris expreſsis Polygonorum anteà incognitorum lateribus: Reverendus Philippus Lanſbergius Trigonometriam Ptolemæi, Regiomontani, Copernici, methodicè contrahendo, pluraque è ſuis adjiciendo, inſigne meruit apud omnes candidos eruditionis præconium; mitto nunc viros præſtantiſsimos S. Stevinum, A. Metium, N. Mulerium, quos omnes idem tetigit propagandæ huius doctrinæ deſiderium: Verum-enimverò inter tot tantoſque ejus inſtauratores, haud quaquam Spartæ ſuæ quam ornandam acceperat, defuit vir Clariſſimus D. WILLEBRORDUS SNELLIUS: ipſe enim annis abhinc aliquot totam Trigonometriam à fonte arceſſere, noviſque & rariſsimis inventis illuſtrare cœpit, jamque opus digeſſerat & prælo deſtinarat, cum ecce Deus omnipotens charum caput, decus patriæ noſtræ, è medio annorũ curriculo ad beatas ſedes transfert: quanto ea res omnes eius notos ac familiares dolore affecerit, *Illuſtriſsimi, Prudentiſsimi Domini* non eſt quod multis narrem; illud teſtor, iniquiſsimam nobis & hiſce ſtudiis fuiſſe ſortem: opus namque confuſum, imperfectum, ac magnâ ex parte mutilum reliquit,

& fuit

& fuit metus nunquam id lucem viſurum, niſi ſedula Typographi obſtitiſſet cura, cuius petitioni refragari, ſimul & Viro optimè quondam de me merito officium hoc qualecunque negare, inhumanum ducebam atque ingratum; ſubij itaque lubens hoc onus, & in ordinem redactis ſingulis partibus, additis etiam nonnullis quæ deſiderari videbantur, fœtum iſtum præcocem nedum perfectum in publicum emiſi, futurum ſperans, ut omnes illi, quibus Autor ipſe plenius ſatiſfacere potuiſſet, nunc quoque libenter hunc rudiori manu perpolitum, excuſatum habituri ſint, nec duriori judicii rigore proſecuturi, maioremve perfectionem deſideraturi, quam res tempuſque ferre potuiſſe ipſis videbuntur.

Vobis autem *Illuſtriſſimi Ordines*, eum offerre non erubui, vobis inquam, quibus ad clavum tantæ Reipublicæ ſedentibus, cuius opes, maximumq; decus hiſce ſtudiis conſervantur, tantus eſt ergà ea affectus, ut indè ab annis benè multis ultrò propoſitis præmiis ad earum cultum quoſcunque patriæ ſuæ amantes provocare ſoleatis: confidens fore, ut quam benevolentiam vivo quondam Autori non ſemel exhibuiſtis, eâdem nunc monumenta ejus quorum fructus meritò ad vos redit, proſequamini.

Vobis etiam *Viri Ampliſsimi D. Conſules*, vel eâ de cauſâ quod confidam eam veſtram fore humanitatem, ut quas aliquando diſciplinas Urbibus veſtris ſplendorem addidiſſe noſtis, eas nunc in clientelam veſtram benigniſsimè recipere non dedignemini.

Illuſtriſsimæ Potentiſsimæ Magnitudini

Conſultiſſimæ Amplitudini veſtræ

Subjectiſsimus

MARTINUS HORTENSIUS D.B.

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LECTORI BENEVOLO.

ANNVS nunc eſt & quod excurrit, ex quo Clariſſimus D. SNELLIVS ὁ μακαρίτης librum hunc prælo committere cœpit; cumque partim per occupationes Typographorum, partim diuturnum ipſius morbum, res lentè admodum procederet, factum ut illo præmaturâ morte terris erepto, nihil præter Canonem Triangulorum typis excuſum manſerit: ibi tum nos continuo deſperare de editione libri, imò de plenariâ eius abſolutione ambigere, D. IOH. MAIRE angi animo ne opera & impenſa periiſſe poſſet: Invento tandem autographo, longo poſt tempore neſcio quo fato poteſtatem videndi mihi facit, ſimul operam flagitat in re tam neceſſaria. Quid facerem? tenuitatis meæ eram conſcius, ſcripta perplexa, confuſa, mutila; videbam Atlanti Hercule opus eſſe ad ſuſtinendum hoc cœlum; tempus longum laboreſque inſuaves exhauriendos; ſumpſi tamen animum, & cum officium hoc humaniſſimo viro negare non poſſem, rem aggreſſus editionis curam in me recepi. Vix pedem in veſtibulo poſueram, cum perluſtratis ſcriptis non pauca deeſſe viderem ac depravata, quibus medicam quà potui manum adhibendo, tantum effeci, ut integer ſaltem (etſi non eo fortè nitore quo ab ipſo Autore erat induendus) prodiret liber: ſtatueram quidem initio, ea quæ adjeceram uncis huiuſmodi [ ] includere, ſed cum jam bona pars libri primi impreſſa eſſet, & Typographus iis omiſſis ſimilem omnibus ſuis membris feciſſet textum, ego quoque poſteà nihil mutandum ratus, ſperavi lectorem Mathematicum id facilè ex diverſitate ſtyli animadverſurum. Quod ad calculum attinet, is planè de novo reiterandus mihi fuit ingenti moleſtiâ, nec tamen eum omninò ἀψευδῆ ſpoponderim, tu amice Lector imitare, & ſi quicquam peccatum emenda: uſus enim ſum tabulis quas hic habes, quibus ut id te

obiter

obiter moneam, cave ne nimium confidas, cum editæ ſint vivo etiamnū Autore, cui tantum otij non fuit ut eas relegere, nedum omnia vitia emendare potuerit: ſubieci quoque utrique Trigonometriæ Problematum ſingulos tractatus, idque in tuum potiſſimum commodum; & quàm vellem id ab ipſo Autore præſtitum! habuit ſcio ſingularia, tum in hiſce tum in alijs quorum ipſe mentionem propoſ. 7 Appendicis facit; ſed ea omnia præceps eius Fatum nobis abſtulit; id culpa ſi in opere hoc quicquam deprehenderis quod exacti eius judicij limam paſſum non fuit, aut etiam animi noſtri propenſionem, quâ omnibus difficultatibus ſuperatis, huc uſque rem perduximus: ſcio non defuturos, qui hæc in faſtum & arrogantiam dicta interpretabuntur, uti hodie calumnijs potius quam favore agitur, ſed eos nihil moror: modò aliqua de Mathematicis benè merendi conceditur occaſio, officio meo haud-quaquam deero; ſed quid ajo? invidiæne deprecatio mihi ſperanda, quæ ne maximis quidem Viris conceſſa fuit?

Quiſquis es ex illo Zoïle nomen habes:

Tu modò benigne Lector conatibus noſtris fave, & hæc uſui ſtudijſque tuis Mathematicis dicata habeto, ac nos quod planè confidimus conſtanter amando Vale.

Ad

Ad Ornatiſſimum, Doctiſſimum Iuvenem; jucundiſſimum, optimum Amicum;

MARTINVM HORTENSIVM.

DAmnoſa flebam funera SNELLII;
Conqueſtus in Parcam illachrymabilem,
Quod ſæva Muſarum perenne
Surriperet columen mearum;
Et quod; recludens immerito mori
Fatale buſtum; tam ſapiens caput,
Quodque Archimedes ipſe adoret;
Ad gelidas traheret catervas.
MARTINE flebam: tu quoque lugubres
Fletus ciebas: at ſua SNELLIVS
Poſt fata vivet, cùm ſuperſtes
Poſthumus hic merito libellus
Tuo politus, carior Indico
Auro, refulget marmore puriùs.
Sic arte Muſam SNELLIANAM
Ad proprios acuis labores:
Sic Ptolemæi te vigor ingenj
Oblectat: & ſic ſpiritus igneus
Euclidis. ô MARTINE pergas,
Nec titulos fugias futuros.

Scribebat

HVGO BOXEL,

L. A. M.

IN

IN TRIGONOMETRIAM

Clariſsimi Viri

D. WILLEBRORDI SNELLII,

poſt mortem ejus in lucem editam.

Perdius & pernox manibus dum Circinus errat,
Et vaſtum Radio metitur SNELLIVS *orbem,*
Arte Syracuſio Sene non minor, altiùs omnes
Scrutatur terraque ſinus, ductuſque ſecantes,
Et labyrintheo contortos more receſſus.
Mox numeros & verba docet, quadrata rotundis,
Quove modo poſsis mutare rotunda recurvis.
Nil dubij jam Conus habet, tereteſque Cylindri,
Nil qui, *ſeſe inter nubila condit*
Pyramis, & Gnomon meliori limite ſignat.
Nec ſatis hæc tentaſſe Viro; mens præpete pennâ
Aſtra ſuper, primas repetens ab origine ſedes,
Evehitur viſura Deos, viſura Penates
Divûm, atque æterno labentia ſydera motu.
Hic dum Semideis multùm miſcetur, & ortus
Stellarumque obitus, & quæ natura negavit
Viſibus humanis, attentius uſque revolvit,
Non ſaturata tamen totum percurrit Olympum,
Extra Anni Soliſque vias, faciliſque jugales
Phœbus, & auratos axes curruſque miniſtrans,
Ut ſolet, admiſſas manibus moderatur habenas.
Interea Terras ſummo proſpectat Olympo,
Cunctaque vel ſolo cernit concurrere puncto
SNELLIVS, *& vanâ deluſus imagine rerum,*
Spernit humum, & quicquid terrarum amplexibus hæret
Ridet, & inſani nimium ludibria Vulgi;
Cœleſtique locum deſignat Iupiter arce
Pro meritis operum, ſpatioque Triangulus amplo

Accipit

Accipit, indigetemque locat, quâ clarior ignis
Emicat, & trinos vocat in certamina ſolus.
Iamque Aries cornu, rutiloque notabilis igne,
Flectit iter, limis Taurumque aſpectat ocellis:
Caſsiopæa ſui capitis Diademate cingit,
Submittitque ultrò faſces, ac cedit honore
Magnus Abantiades, & diræ Gorgonis ora
Mitiùs avertit, pedibus dum vincula nectit.
Primus ibi è multis magnâ comitante catervâ
Amplexus ruit in medios, dextrâque ſalutat,
Et Batavum tanto dignatur Aratus honore,
Alphonſuſque, caput cinctus Diademate, greſſus
Dirigit, & ſolio Cimbrorum gloria Tycho
Collocat, agnoſcens vultum venientis & ora.
Pone tamen luctus tanto viduata Magiſtro
Patria, nec ceſſent volitare apluſtria Tiphy,
Alter Tiphys adeſt Batavam qui diriget Argon.
Iamque, animæ pars magna meæ, ſuccedit Atlanti
Amphitryoniades magnis HORTENSIVS *auſis,*
Atque laborantem Veſtam, cœlumque ruinam
Cum ſonitu minitans, ſuppoſto vertice fulcit.
Vivant fælices tali rectore Batavi,
Vivant, & DELPHI *tanto lætentur alumno.*
At vos fælices animæ, quas vivida virtus
Extulit, & patrio pietas aſſcripſit Olympo,
Gnoſiaca Heroi ſervetis ſerta Coronæ.

Ludebat

IOH. CORNELI Wourdanus.

WILLEM

Willebrordi Snelli a Royen, R. F. Doctrinæ Triangvlorvm Canonicæ,

Liber Primvs.

De inventione rectarum Circulo adſcriptarum.

I. Propositio.

Adſcriptarum doctrina Canonica eſt, quando è peripheriis adſcriptæ earundem relativæ; & viciſſim ex adſcriptis peripheriæ per numeros inveniuntur.

GEometria, ſive στοιχείωσις, quatenus omnia per circinum & regulam perficiunda ſibi proponit, & demonſtrat, ita ſimilium omnium Triangulorum affectiones ſibi explicandas ſumit. Atqui cum omnium angulorum ratio inter ſe, & comparatio, Geometricè & Apodicticè definitè ſecundum datam menſuram explicari nequeat, Magni Heroës iſti, & inter veteres nominis celebritate facile primi, haud difficulter notaverunt quid peripheriæ beneficio & comparatione rectæ inſcriptæ præſtari poſſit. Itaque jam tum, ante annos biſmille, & quod excurrit

viri ſummi, & inter eos princeps Hipparchus eam iniverunt rationem, ut poſita ſemidiametro, particularum quotcumque, inſcriptarum quarumcumque quantitas ſecundum hanc definiretur. Nam ita etiam hodie radium circuli in particulas 100000, 1000000, 10000000, aut 10000000000, tribuimus, & ſecundum has, adſcriptas ſuarum peripheriarum relativas exhibemus per ſingula ſcrupula. Neque enim ignotum eſſe cuiquam poteſt, qui vel à primo duntaxat limine Geometriam deguſtaverit, omnem circuli perimetrum in partes 360, quas gradus vocant tributam; ut ſemicirculo cedant gradus 180; quadranti autem 90. Ad has igitur peripherias, per ſuos gradus & minuta ſive ſcrupula ſingula, tanquam minimas particulas quæ in uſu requiruntur, rectę adſcriptæ ipſarum relativæ referuntur. Et hæc quidem Ptolomæo vocatur ἡ τῶν ἐν τῷ κύκλῳ εὐθειῶν πραγματεία. Quam poſteri, & maxime hoc ſeculo viri docti luculentis acceſſionibus adauxerunt.

Adſcriptas autem non ita ſtricta notione intelligo, ut Geometræ ſolent; quibus ſolæ circulo inſcriptæ, vel tangentes hoc nomine veniunt; ſed etiam rectas è centro eductas & peripheriam ſecantes; quemadmodum iſta ſuis locis ſigillatim explicabuntur. Harum rectarum uſum aliquem in ſua circuli dimenſione Archimedes expreſſit; quod conſilium Ptolomæus quoque libro ſexto magni operis eſt ſecutus. Sed ejuſdem longe ampliſſimus campus per univerſam Matheſin ſe diffundit, cum in Triangulis planis, aut tripleuris ſphæricis, ex datis tribus terminis reliqui tres inveniuntur: atque ideò etiam ab uſu potiſſimo *Doctrina Triangulorum Canonica* appellatur.

Porrò autem cum anguli in centro ſint ut peripheriæ

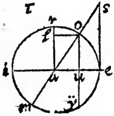
riæ in quas inſiſtunt, inde factum ut ipſæ peripheriæ pro angulorum menſura aſſumantur. Vt rectum 90. gradibus; acutum paucioribus; obtuſum pluribus definitum intelligamus. atque ita etiam ipſæ adſcriptæ, non tantum ad ſuas peripherias, verum ad angulos quoque qui in iſtas peripherias inſiſtunt pariter referantur. Cum, ut diximus anguli menſura ſit peripheria, ex ejus vertice, tanquam centro deſcripta.

In peripherijs porrò hic & data, & eius complementum ſæpè in partes vocantur. Nam quod idem de angulis dictum intelligatur. *Complementum eſt datæ peripheriæ à quadrante, differentia.*

Sive peripheria data maior, ſive quadrante ſit minor; ſed ut angulus omnis duobus rectis eſt minor, ita data peripheria quoque ſemicirculo ſemper minor intelligatur. ut ſi in diagrammate ſequenti *eo* aſſumatur ut data, ejus complementum erit *or*. Et ſi *iro* peripheria major aſſumatur, nihilo minus erit eadem *or* ejus complementum. Idem in angulis locum habet, ut, anguli acuti complementum ſit ejus à recto defectus: obtuſi, ejuſdem ſupra rectum exceſſus, quæ utique negligenda non ſunt.

II. PROPOSITIO.

Rectæ peripheriarum ſuarum relativæ ſunt ſinus, tangens & ſecans.



VT hic in propoſito diagrammate ſit *a* centrum circuli, peripheria *oe*, radius *ae*, perpendicularis à termino *o* in radium *ae* ſit *ou*, extremæ diametro perpendicularis *es*, & radius per *o*

 terminum

terminum eductus *as*. hic *bu* ſinus eſt peripheriæ *oe*; *es* tangens ejuſdem; & *as* ſecans. In Geometria quidem tangens & ſecans infinitè dicuntur, neque ulla certa & definita menſura concipiuntur; hic autem propoſitis peripherijs aſtringuntur, & magnitudinem habent ſecundum illas definitam. ea igitur amphibolia tollenda, & ſuarum peripheriarum modulo erat circumſcribenda.

III. PROPOSITIO.

Sinus rectus eſt recta ab altero peripheriæ termino, diametro per reliquum eductæ perpendicularis.

SINVS nomen hac quidem notione à Latina lingua eſt alienum. Et Barbaro illo ſeculo uſurpari cœptum, cum ab Arabibus etiam Græcos ſcriptores mutuarentur, Arabes enim ut videtur primi pro inſcriptis veteri Græciæ uſitatis, earum ſemiſſes ſumma cum utilitate adhibuerunt. atque ita à Gebro vertente Gerardo Cremonenſi definitur Sinus arcus, medietas chordæ peripheriæ duplæ. ut hoc nomen à Cremonenſi primum in ſcholas ſit illatum, aut cum jam ante receptum eſſet, ab eo uſurpatum. niſi forte ab Appiano ſit ſubſtitutum, certè Plato Tiburtinus multo Cremonenſi recentior, quique Albategnium convertit aliter longe Gebrum loquentem introducit. Cum ergo (inquit,) chordam cujuſlibet gradus ex his chordis medietatis, per tabulam ſcire volueris, quære in tabula medietatum chordarum, &c. chordam igitur medietatis majores noſtri Latine ſinum dixerint. Quamobrem cum uſu jam hoc nomen tritum ſit & receptum, ob ſummam brevitatem ſane teneatur. Eſto jam data peripheria *oe*, diameter *ei*, recta à reliquo

liquo termino *o* huic perpendicularis, *ou* ſinus erit peripheriæ *oe*. Vel ſi aſſumatur peripheria *oey*, quam ſubtendat recta *oy*. Atque in eam perpendicularis ſit radius *ae*, iſte inſcriptam *oy* & peripheriam *oey* biſſecabit, dimidium itaque hujus inſcriptæ *ou* relatum ad dimidiam peripheriam *or* ejus ſinus eſt. Ptolomæus, & aliquot antea ſeculis Hipparchus, & ante Hipparchum quoque haud dubie & Ægyptij & Babylonij tabulas inſcriptarum uſurpaverunt. Nos majore cum compendio, inſcriptarum ſemiſſes, ſive ſinus adhibemus. Porrò etiam peripheriæ reliquæ *or* ſinus *ol*, eſt ſinus complementi datæ peripheriæ *oe* vel *oi*. Itaque

Sinus, & peripheriæ quadrante minori, & ejus reſiduo communis eſt.

Reſiduum autem voco datæ peripheriæ à ſemicirculo differentiam, vulgo complementum ad ſemicirculum, verum cum hæc circumlocutio ſit moleſta, & tutius ſit res diverſas diverſis nominibus diſtingui, complementum, ut ſupra definivimus, nobis tantum erit differentia inter datam peripheriam & quadrantem. reſiduum autem exceſſus ſemicirculi ſuper datam peripheriam, & ideo data ſemper ſemicirculo minor intelligatur.

Ut enim inſcripta *oy* baſis eſt ſectioni minori *oey*, & majori *oiy* communis; ita ſemiſſis inſcriptæ *ou*, ad utramque peripheriam *oe* & *ori* quoque refertur.

IV. PROPOSITIO.

Sinus verſus eſt ſegmentum diametri inter ſinum rectum peripheriæ & eius terminum interiacens.

VT in eodem diagrammate peripheria data ſit *or*, ſinus rectus diametro perpendicularis *ou*,

verſus erit *ue*. At ſi peripheria data ſit *ori*, ſinus rectus quidem erit eadem *ou*; ſed verſus recta *ui*. Et Vitello hac voce iſta notione uſus eſt prop. 12. lib. 5. & 38. l. 9. & ibidem hanc vocat ſagittam.

Itaque

Sinus verſus datæ peripheriæ minoris, eſt ſinus complementi eiuſdem à radio differentia : majoris autem ejuſdem & radij ſumma.

Ut hic *or* complementum eſt utriuſque peripheriæ *eo* & *oi*, ejus ſinus *or* vel *au*; hac de radio *ae* ſubducta datur *ue* ſinus verſus peripheriæ *oe*. Contra ſi *au* ad radium *ai* addas dabitur *iu* ſinus verſus peripheriæ quadrante majoris *oi*.

V. PROPOSITIO.

Sinus rectus peripheriæ & complementi æque poſſunt radio.

NAM *ou* & *au* cui *ol* æquatur, rectum comprehendunt angulum, cui radius *ao* ſubtenditur.

Ad quantitatem rectarum circulo inſcriptarum definiendam Ptolomæus more veteris Græciæ, diametrum circuli in 60. partes tributam aſſumpſit, & ſingulas partes in ſexaginta particulas ſubdiviſit; atque ita porrò, idque ut calculus, qui illo ævo lente admodum procedebat, & erat intricatiſſimus, hac logiſtica ſexagenaria paulo eſſet expeditior. quæ ratio etiam ſuperioribus annis à multis eſt frequentata. Interim tamen jure ſuo & merito obtinuit ea radij partitio, quam Regiomontanus & ejus præceptor Peurbachius candidæ animæ in Mathematicos Abacos intulerunt. Ut radius in aliquot millenas partes tanquam continuo decimarum progreſſu tribueretur. Nempe in 100000, 10000000,

10000000, aut alias plures particulas; & ſecundum iſtas peripheriarum quarumvis ſinus invenirentur. & ne in infinitum res abiret, ac aliquis modus ſinuum multitudini poneretur, qui ad omnem uſum eſſet ſatis, Peripheriæ quadrantem *eor* in 90. gradus, & gradus ſingulos in 60. particulas, quæ *ſcrupula* vel *minuta* vocantur, diſtribuerunt. Vt tota quadrantis peripheria in 5400, particulas diviſa intelligatur, & totidem ſinus in Sinuum Canone ordinandi veniant.

Ad horum porrò inveſtigationem, ordinatorum polygonorum latera primam ſternunt viam, quæ quidem per circinum & regulam ex elementis circulo inſcribuntur.

VI. Propositio.

Semiſſes Laterum inſcripti Trianguli, quadrati, quinquanguli, ſexanguli, decanguli; ſunt ſinus 60, 45, 36, 30, *&* 18 *graduum.*

Nam ſi totam peripheriam 360 gr. per 3, 4, 5, 6, 10, dividas dabitur numerus graduum à ſingulis lateribus ſubtenſus. nempe 120, 90, 72, 60, 36. Ut in primo diagrammate ſi *oy* ſit latus Trianguli ordinati in circulum inſcripti peripheria *oey* erit 120 graduum, ergo dimidia *oe* 60, & dimidia inſcripta *ou* ejus ſinus. atque ita de reliquis.

Quantitas autem horum laterum ex elementis eſt repetenda.

Latus inſcripti ſexanguli æquatur ejuſdem circuli radio, itaque ſi radius ſit 100000000, ejus dimidium 50000000 erit ſinus 30 graduum.

Latus Trianguli poteſt triplum circularis radii; erit itaque ejus quadratum 30000000000000000,

& hujus latus 173205081, dimidium 86602540 ſinus 60 gr.

Latus quadrati poteſt duplum radij, erit igitur 141421356, hujus dimidium 70710678 ſinus 45 gr.

Latus decanguli eſt majus ſegmentum radij media & extrema ratione ſecti. erit igitur illud 61803399, cujus dimidium 30901699 ſinus 18 graduum.

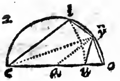
Latus quinquanguli æquè poteſt lateri ſexanguli & decanguli eidē circulo inſcriptorum. Inde igitur nobis quinquanguli latus dabitur 117557050, cujus dimidium 58778525 erit ſinus 36 graduum.

Et quindecangulum quoque, & latera polygonorum ex iſtis continua biſectione derivatorum, & horum complementa, & quæ per compoſitionem aut ſubductionem peripheriarum quarum inſcriptę dantur inveniri poſſunt, ad ſinuum plurimorum inventionem neceſſaria ſunt; ideoque ad iſtorum inveſtigationem hæc theoremata ſubjicimus.

VII. PROPOSITIO.

Rectangulum ſub inſcripta à diametro differentiâ & radio comprehenſum, æquatur quadrato inſcriptæ dimidii reſidui ad ſemicirculum.

ID quoque Ptolemæus Magni operis lib. 1. cap. 9. demonſtravit atque adeò ad biſectionem valde eſt oportunum; & nobis quidem maxime, quod radius in milleſimas tributus aſſumatur, ut ideo multiplicatione opus nō ſit. Eſto ab altero diametri termino inſcripta *ei*, eidemque in diametro



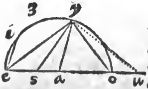
tro æqualis *eu* & reſidua peripheria *io* biſecta in *yo*, ajo rectangulum ſub *ao* & *ou* cōprehenſum æquari quadrato inſcriptæ *oy*. connectantur enim *yu ya ye*; cum igitur anguli *iey uey* æquicruri, æqualibus peripherijs inſiſtant habebunt baſes *iy*, *uy* æquales. Triangulum *uoy* æquicrurum, Triangulo æquicruro *ayo* erit ſimile, quia anguli ad baſin inter ſe æquantur. Atque ideo etiam *ao oy ou* latera continue proportionalia, & rectangulum extremorum *ao ou*, æquale quadrato mediæ *oy*. Quod demonſtraſſe oportuit.

Ut aſſumpta *ei* pro ſubtenſa 36 gr. ſeu latere decanguli 61803399, poſita diametro partium 200000000, ejus peripheriæ reſiduum ſunt 144 gr. cujus dimidij 72 gr. ſubtenſa quæratur. latus decanguli de diametro deductum relinquet 138196601, is numerus per radium multiplicatus dabit 13819660100000000 quadratum inſcriptæ 72 gr. & ideo ipſam ſubtenſam *oy* 117557050, cujus dimidium 58778525 ſinus eſt 36 gr.

Si illud quadratum de quadrato diametri ſubduxiſſes, reliquum foret quadratum *ye* nempe 26180339900000000, unde facile liquet, ſi datam inſcriptam ad diametrum addas, & per radium multiplices, dari quadratum inſcriptæ quæ peripheriam è data & dimidia reſidua compoſitam ſubtendat. Sed id quoque ab ipſa Geometria placet arceſſere.

VIII. PROPOSITIO.

Rectangulum ſub recta à diametro plus inſcripta & radio comprehenſum, æquatur quadrato inſcriptæ quæ & datam & dimidium eius reſiduum ad ſemicirculam ſimul ſubtendit.



ESTO inſcripta *ei*, reſidui dimidium *iy*, ſubtenſa compoſitæ *ey*, & ipſi *ei* ſit æqualis *ou*. Ajo rectangulum *ue ea*, æquari quadrato *ey*. ſit enim *es* æqualis ipſi *ei*. erit itaque *sy* rectæ *yo* per propoſitionem antecedentem æqualis. atque ideo anguli ad *s*, *o* interni æquales, & propterea externi quoque *esy uoy*, qui cum æquicruri ſint, baſes *ey uy* habebunt æquales. Et Triangulum *uey* æquicrurum triangulo æquicruro *eay* erit æquiangulum, quia angulum ad *e* habent communem. Atque ideo *ue ey ea* latera continue proportionalia, quadratumque *ey* rectangulo *ue ea* erit æquale.

Sit *ei* peripheria decima totius circuli pars 36 gr. ejus reſiduum igitur *iyo* 144 gr. hujus dimidium *iy* 72 gr. & detur *ei* partium 61803399, hic addatur diameter *eo*, & erit tota *eu* 261803399, factus ab *ue* in *ea* radium 26180339900000000 æquatur quadrato *ey*, unde ipſa *ey* datur 161803399, ſubtenſa 108 gr. cujus dimidium 80901699 eſt ſinus 54 gr.

Atque ita hæc utraque ſectio reciprocari continuè poterit, unde inſcriptæ & ſinus plurimarum peripheriarum invenientur, qui ubi in ſcrupulis integris non terminabuntur, in Canonem ſinuum inſerri

inferri non debent, quia illi tantum ad gradus & ſcrupula integra ſunt ordinati. Niſi forte ut Magnus ille Rheticus ſcrupulorum particulas quoque conſecteris; qui eos canones ad ſextas primorum ſcrupulorum partes proſecutus eſt.

Exemplum hoc antecedens continuatum κατὰ διχοτομίαν pro typo ſubjiciam aſſumpto radio particularum 100000000.

gr. min.	Subtenſæ inſcriptæ.	gr. min	Subtenſæ inſcriptæ reſidui.
72. 0	117557050	108. 0	161803399
36. 0	61803398	144. 0	190211303
18. 0	31286893	162. 0	197537668
9. 0	15691819	171. 0	199383466
4. 30	7851968	175. 30	199845807

Harum inſcriptarum ſemiſſes erunt ſinus, dimidiarum peripheriarum. hoc ordine & modo.

gr. min.	Sinus	gr. min.	Sin. compl.
36. 0	58778525	54. 0	80901699
18. 0	30901699	72. 0	95105651
9 0	15643446	81. 0	98768834
4. 30	7845909	85. 30	99691733
2. 15	3925984	87. 45	99922903

Id autem tibi notandũ ſemper duobus aut tribus, ut minimum circulis, ſinum totum initio majorem aſſumi debere, quam ſit ille ſecundum quem tabulas velis ordinare, ob lubricitatem & calculi varietatem. Ita hic quidem inventus eſt ſinus 2 gr. 15 ſcr. 3925984, qui tamen revera ſit minor nempe 3925981.

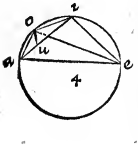
3975981 cum ſinus totus ponitur 100000000. ut tantum ad ſeptem circulos ille numerus ſit ſanus & integer.

Hujus rei cauſam quoque aperiemus, ne hic caſus videatur fortuitus. cum enim inſcripta 171 gr. 199383466 de diametro ſubducta relinquat 616534, in quo ſunt notæ tantum ſex, numerus iſte reliquus per radium multiplicatus non poterit nobis exhibere plures numeros integros & ſanos quam ſex ut ſummum. Atqui hic ſunt ſeptem: unde efficitur ultimum neceſſariò eſſe lubricum & à vero alienum; ſi itaque hoc modo biſecando ulterius velis progredi, radius duabus aut tribus notis major ab initio tibi erit aſſumendus. Atque ita datorum polygonorum peripherias & quaſcunque alias biſecando, in infinitum progredi licebit, modo radij quantitatem initio aſſumas oportunam.

Sequitur inventio inſcriptarum, ubi è datis ſubtenſis earundem peripheriarum, ſummæ aut differentię ſubtenſa quoque datur.

IX. Propositio.

Si quadrilaterum circulo ſit inſcriptum duo oppoſitorum laterum rectangula, æquantur rectangulo diagoniorum.

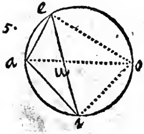


E Ptolemæi cap. 9. lib. 1. qui iſta ab Hipparcho mutuatus eſt. Sit in circulo quadrilaterum inſcriptum *aeio*, cujus diagonij ſunto *ai* & *oe*. Ajo rectangulum *ai* in *oe*, æquari rectangulis oppoſitorum laterum *ae* in *oi*, & *ao* in *ei*.

ao in *ei.* nam ſi latera oppoſita ſint æqualia , tum quidem ex elementis rectangulum diagoniorum, oppoſitorum laterum rectangulis æquabitur; quadratum enim baſis recti anguli, crurum quadratis æquale eſt. At ſi oppoſita latera ſint inæqualia, ut hic, tum angulo *aoe* angulus *iou* ſtatuatur æqualis: cum igitur *oiu*, *oea* in eandem peripheriam *ao* inſiſtant, ijdem quoque æquales erunt: atque ideo triangulum *oiu* triangulo *oea*, æquiangulum lateribus quoque proportionale. Hoc eſt ut *ae* ad *eo*, ita *ui* ad *io.* Simillime quoque, cum per fabricam *aoe* angulo *iou* æqualis ſit, & angulus *uoe* intermedius communis; etiam angulus *ioe* angulo *aou* æqualis erit: ſed & *oau oei* in eadem peripheria æquales ſunt, & triangulum *aou* triangulo *oei* ideo ſimile. hoc eſt, ut *ao* ad *au*; ita *oe* ad *ei.* quare rectangulum *ae* in *oi*, rectangulo *oe* in *iu*; & *ao* in *ei* rectangulo *oe* in *au* æqualia erunt. Hoc eſt duo oppoſitorum laterum rectangula rectangulo diagoniorum æquabuntur. Quod erat demonſtrandum. Atque inde Ptolomæo duo conſectaria derivantur.

I. CONSECTARIVM * κτ᾽ σύνθεσιν. (* per compoſitionem.)

Datis duabus inſcriptis, datur inſcripta utrique pariter ſubtenſa.

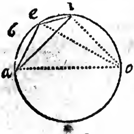


SI enim *ai* latus quadrati particularũ 141421356, quantarum circuli diameter 200000000; & *ae* latus ſexanguli 100000000; & quæratur ſubtenſa utrique *ei*; inſcripta nempe 60 & 90, hoc eſt

eſt 150 gradibus pariter ſubtenſa. ſit diameter *ao* à qua *ae ai* inſcriptæ in adverſas partes diſcedant: hinc *eo io* ad diametri terminum eductæ cum iſtis rectum comprehendent angulum: quare ex data *ae* dabitur quoque *eo* 173205081, & ex *ai* ipſa *io* 141421356. Dantur itaque quadranguli *aeio* latera quatuor. atque ideo duo oppoſitorum laterum rectangula *ae* in *io*, & *ai* in *eo*, quorum ſumma rectangulo diagoniorum *ao* in *ei* æqualis oſtenſa eſt: ea igitur per diametrum *ao* 200000000 diviſa, dabit reliquam diagonium *ei* ſubtenſam 150 grad. 193185165: cujus dimidium 96592582. Sinus eſt 75 graduum. Atque eodem in omnibus proceſſu, dabitur inſcripta quæ duabus datis ſubtendatur. unde plurimarum peripheriarum ſinus dari evidens eſt.

II. CONSECTARIVM * κατ' ὑπεροχήν.
(* per differentiam.)

Datis duabus inſcriptis datur inſcripta earundem peripheriarum differentiæ ſubtenſa.



ESTO iterum in hoc diagrammate *ai* latus quadrati, & *ae* latus ſexanguli in ſemicirculo, ab eadem diametri parte; & quæratur *ei*, harum peripheriarum differentiæ ſubtenſa, principio igitur, ut ante, dabuntur inſcriptæ ad ſemicirculum reliquæ *eo* quidem 173205081, & *io* 141421356. ſi igitur rectangulum laterum *ae* in *io*, à rectangulo diagoniorum *ai* in *eo* deducas relinquitur rectangulum *ao* in *ei*.

Atqui

Atqui datur diametur *ae* 200000000; dabitur itaque & reliquum latus *ei* 51763809 inſcripta 30 graduum, cujus dimidium 25881904 ſinus eſt gradum 15, atque ita in cæteris analogia conſimili. Hinc itaque per compoſitionem & per differentiam plurimæ peripheriæ invenientur.

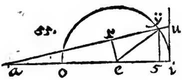
Sed ad totius canonis abſolutam perfectionem iſta fruſtra ſunt, niſi etiam ſinus unius minuti exhiberi poſſit. Id autem quam operoſum fuerit paſſim videre eſt apud eos qui hanc artem οὐκ ἐκ παρέργου tractare inſtituerunt. Sed nos noſtras leges ſecuti expeditiſſime exhibebimus quæ alij operoſiſſimè conſectantur.

X. PROPOSITIO.

Datæ peripheriæ debitam inſcriptam veræ adeò propinquam in numeris exhibere, quam erit ratio diametri ad totam peripheriam data.

PROPOSITIO eſt octava & triceſima noſtri Cylometrici, cum enim ante propoſitione 31 ejuſdē oſtendiſſemus poſita diametro 200,00,000 & peripheria 628,31,853, tum inde dari ſinum unius gradus in ijſdem partibus accuratè ſi octò notarum ſtatuatur diameter ſinum dimidij gradus in ijſdem partibus, ſi tredecim ſinum unius ſcrupuli, ſi novendecim etiam ſinum unius ſecundi. His inde aſſumptis nunc diagrammatis rationem & calculum tantum explicabimus. Propoſitum itaque eſto nobis ſubtenſam duorum ſcrupulorum, vel ſinum unius ſcrupuli invenire.

Sit



Sit *yi* peripheria 1 ſcrupuli & *ui* tangens, *ao* radio æqualis; recta itaque ab *a* per *y* tangenti occurrens in *u* abſumet rectam *ui* ſecundum leges expoſitas peripheriæ *yi* æqualem. ſinus peripheriæ *yi* ſit *ys*, & in *ay* ſit perpendicularis *er*. Cum itaque ſecundum rationem expoſitam diametri 20000000000 ad peripheriã 314159.26536 peripheria unius minuti ſit 2908882 ſed vera pauxillo minor; erit itaque *ui* quoque tanta. Ex quadratis itaque *ai* & *iu* datur quoque quadratum *au* 30000000141, atq; inde proportio ut *au* 3000000141 ad *ui* 2908882; ita *ae* 20000000000 ad *er*. 1939254. Hujus quadratum de quadrato *ae* ſubductum dabit nobis rectam *ar* 19999999906; & de *ey* deductum dabit *yr* 9999999812. unde tota *ay* datur 29999999718. Et hinc obſimilitudinem proportio, ut *ae* 20000000000 ad *er* 1939254 ita *ay* 29999999718, ad *ys* 2908881.

Ego in hoc opere ſecutus ſum ubique terminum minorem ideoque hic ſinus vero unitate eſt minor: is enim fuerit 2908882. ſi ad decem notas ſartum voluiſſes initio terminus ad undecim notas fuiſſet tibi aſſumendus.

Atque hinc jam per συνθεσιν componendo univerſam ſinuum tabulam perficere licet. Quin adeò ſi tabulis deſtitutus ſinum poſtules datæ peripheriæ quæ non ſit major 22 grad. 30 ſcr. ad radium 10000 hæc eadem via eum tibi præſtabit. Et facilius multo ſi dato ſinui poſtuletur peripheria debita. Sed noſtrum cyclametricum adito, ubi iſta accuratius ſumus proſecuti.

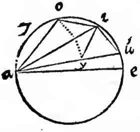
Sinum unius minuti alij per continuam biſectionem

nem & inde per proportionem concludunt; Alij ſolidius elegantiuſque per æquationes analyticas; quorum Choragus Magnus ille Vieta in ſuo ad Problema Adriani Romani reſponſo. Eos igitur adeundos tibi cenſeo. Nos noſtra ſecuti ſumus tanquam ſimpliciora & uſui oportuna.

Atque iſta hactenus de inſcriptarum operoſa per ſuas regulas inventione dicta ſunto, ſed & compendia huic negotio oportuna ſunt inventa, unde haud difficulter plurimæ vel inſcriptæ, vel ſinus inveniri poſſint.

XI. Propositio.

Si duæ peripheriæ à circuli triente æqualiter diſtent, earundem inſcriptarum differentia æquabitur inſcriptæ diſtantiæ.



THeorema expeditum ad ſinuum plurimorum inventionem per ſolam additionem aut ſubductionem; Sit enim *ai* latus trianguli æquilateri; & ab *i* puncto utrimque *iu io* peripheriæ æquales, & ipſis inſcriptæ à termino diametri *ao au*; ajo differentiam inſcriptarum *ao au*, æqualem eſſe inſcriptæ *oi* vel *iu*: ſit enim ipſi *ao* æqualis *ay*, & connectatur *iy*; triangula igitur *aio aiy* circa angulos ex hypotheſi ęquales latera habent æqualia, atque ideo ſunt æquiangula, & æquilatera; quare *oi* & *iy* æquantur: ſed *oi* & *iu* quoque æquantur; ideoque *yi* & *iu* crura æquabuntur; angulus autem *aui* inſiſtit in circuli trientem: &

ideo *yui* valet $\frac{2}{3}$ recti; & angulus *iyu* eidem æqualis eſt; & reliquus ideo *yiu* etiam $\frac{2}{3}$ recti implebit. Quare *yiu* triangulum erit æquilaterum.

Hinc adeo datis inſcriptis omnibus ad gradum uſque 120, reliqui uſque ad 180 omnes ſola additionis via quoque dabuntur.

Ut ſi aſſumatur inſcripta 108 graduum 161803-399, & quæratur inſcripta 132 gr. diſtantia utriuſque à 120 gradibus eſt 12. Cujus inſcripta 2090-5692, ea ad inſcriptam 108 addita dabit inſcriptam 132 graduum 182709092. Cujus dimidium 91354546 fit ſinus 66 graduum, poſita ſemidiametro particularum 100000000.

Et contra data inſcripta majore & inſcripta diſtantiæ, dabitur inſcripta tanto minor, quanto propoſita 120 gradibus erat major.

Itaque

Si duæ peripheriæ à circuli ſextante æqualiter abſint, ſinus differentiæ æquatur ſinui diſtantiæ.

Conſectarium protenus ex antecedente propoſitione eſt manifeſtum: quod enim illic de totis inſcriptis, id hic de earundem ſemiſſibus quoque verum eſt. Sinus 45 graduum eſt 70710678, ſinus 15 gr. eſt 25881905, hi compoſiti dabunt 96592-583, qui ſinus eſt 75 gr. Nam 15 & 60 hunc numerum conflant.

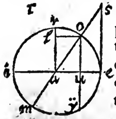
Atque ita Canon ſinuum per ſingula minuta nobis ſubductus & ordine digeſtus eſto; extra circulum vero etiam conſiderantur *Tangens* & *Secans*.

XII. PRO-

XII. PROPOSITIO.

Tangens eſt recta peripheriæ ſuæ relativa, eandem in altero termino contingens, & à radio per reliquum terminum educto, intercepta.

IN Geometricis quidem recta infinita circuli peripheriam contingens abſque ullo partium reſpectu ad quas referri ſoleat, definitur. Hic autem ejus infinitæ rectæ lineæ partes ad certas peripheriæ partes alligantur.



In expoſita diagrapha ſit peripheria data *eo*, rectaque in *e* contingens, cui radius *ao* per reliquum terminum continuatus occurrat in *s*; tum *es* tangens refertur ad datam peripheriam *eo*.

Sed & eadem tangens ad reliquam ſemicirculi peripheriam refertur; quia eadem *es* tangens quoque eſt peripheriæ *ori*: continuetur enim radius *ao* in *m*, erit angulus *iao* angulo *mae*; & peripheria *ori* peripheriæ *eym* ideo æqualis. Cum igitur *se* cum *am* continuata, verſus *m* concurrere non poſſit, quia *mae* obtuſus eſt, concurret tamen *m a* verſus *o* in *s*; & ita ſecundum poſitam definitionem *es* quoque tangens erit peripheriæ *eym*: ut enim ſinus majori & minori peripheriæ communis eſt, ita quoque tangens.

XIII. PROPOSITIO.

Vt ſinus complementi ad ſinum datæ peripheriæ, ita radius ad eiuſdem datæ tangentem.

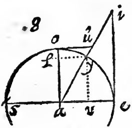
RES in eodem diagrammate clara eſt: cum enim triangula *auo aes* ſimilia ſint, quia *ae* radius utrique *ou* & *es* perpendicularis eſt; ut *au* ad *uo*, ita *ae* ad *es*. Sitque data peripheria *oe* ſinus complementi erit *ol*, vel ei æqualis *au*.

Atque inde dato canone ſinuum, tangentium quoque canon ſola diviſione abſolvetur. Sit enim *oe* peripheria ſexaginta graduum, *or* triginta. Erit ut *au* ſinus 50000000 peripheriæ *or*, ad *uo* 86202540 ſinum periperiæ *oe*, ita radius, ſeu ſinus totus 100000000 ad 173205080 tangentem 60 graduum. Sed ut is bene legittime conſtituatur, ad taxationem diametri ſeptem notarum, opus eſt ſinuum tabulas, ut minimum ad novem circulos ſubduci; nam ut ſupra monuimus, in multiplici compoſitione, ſubdiviſione, duplicatione, aliquis noviſſimis notis error objicitur, qui ne etiam in illas notas incidat, quas ſartas tectas, & ab omni vitio integras poſtules, cautio eſt: certè circa ultimos Canonis limites, in noviſſimis gradibus, ad undecim aut duodecim circulos ſinibus ſubductis opus erit. In iſto autem quod ſupra poſuimus exemplo tangens legittima eſſet 173205080$\frac{76}{100}$, quæ ferè unum integrum conflant.

XIV. PRO-

XIV. PROPOSITIO.

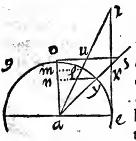
Radius inter tangentem peripheriæ & complementi medius proportionalis eſt.



IN propoſito diagrammate eſto data peripheria *ey*, & tangens ejus *ei*; complementum autem *yo*, & tangens *ou*. erunt igitur latera *ou ae*, *oa ie* parallela, & triangula ideo *auo aie* ſimilia. Quare ut latus *uo* ad *oa*, ſic *ae*, hoc eſt *oa* ad *ei*. Atque hinc quoque ſola diviſione datis tangentibus ad gradum quintum & quadrageſimum omnibus, reliqui majores omnes radij quadrato per iſtos diviſo dabuntur.

XV. PROPOSITIO.

Duarum inæqualium peripheriarum tangentes, ſuorum complementorum tangentibus reciproce proportionales ſunt.

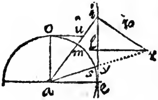


SUnto enim bis binæ peripheriæ *ey yo*, *el lo*, & harum tangentes *er os*, *ei ou*. Ajo ut *er* ad *ei*; ſic viciſſim *ou* eſſe ad *os*. quia rectangulum *er* in *os*, & *ei* in *ou*, nempe à tangentibus peripheriarum & tangentibus complementorum, eidem radij quadrato æqualia ſunt.

BIBLIOTECA NAZ. ROMA VITTORIO EMANUELE

XVI. PROPOSITIO.

Duplum tangentis datæ peripheriæ cum tangente dimidij complementi, æquatur tangenti compoſitæ ex data & eiuſdem complementi dimidia.



SIT *em* data peripheria major, ejuſque complementum *om*, harum differentia *es*, earumque tangentes *ei ou es*. Ajo *ei* tangentem, tangenti *ou* & *ey* bis ſumptæ æqualem eſſe; Continuetur enim *ay* ſibi æqualiter in *r*, ſitque in tangentem *ei* perpendicularis *lr*, & connectatur *ir*; Cum igitur *iay* angulus, angulo *iao* ob biſectionem æqualis ſit & *aiy* eidem ob paralleliſmum rectarum *ao* & *ei*; efficitur triangulum *aiy* ad baſin *ai* æquiangulum, & ideo quoque æquale cruribus *ay yi*; ac propterea latus *iy* ipſi *yr* æquale, quare angulus *air* rectus erit; ſed & *oae* rectus eſt; ſubducto igitur illinc angulo *aie*, hinc autem *oau*, reliquus *yir* reliquo *iae*, hoc eſt angulo *oua* æqualis erit: ſed & triangula *aye ryl* ſunt æquilatera, quia anguli ad verticem *y*, & recti ad *e* & *l*, & latera *ay yr* æqualia ſunt: quare *aou rli* triangula habentia *ao* & *rl* latera æqualia & angulos duos æquales erunt æquilatera; & *il* igitur ipſi *ou* æqualis, & *le* dupla *ey*. Quare tangens *ei* tangenti *ou*, & duplæ *ey* æqualis erit, quod erat demonſtrandum.

Atque hinc adeo datis tangentibus omnibus ad 45 gr. reliqui omnes ſola additione conflabuntur. Sit enim nobis inquirenda tangens 45 gr. 1 ſcr, tanquam pro peripheria *em*, hujus complementum

44 gr.

44 gr. 59 ſcr. ſit pro peripheria *om*, differentia utriuſque *ſe* o gr. 2. ſcr. ejus itaque tangens 58178. duplum autem 116356. id additum ad 99941839 tangentem 44 gr. 59 ſcr. conflabit 100058195 tangentem 45 gr. 1 ſcr. ut quærebatur.

Secundo ſit peripheria *em*, 75 gr. 3 ſcr. cujus tangens quæratur pro peripheria *em*, hujus complementum eſt 14 gr. 57 ſcr. *om*, differentia autem 60 gr. 6 ſcr. pro *ey*, hujus tangens 173905333, duplum 347810660, ad tangentem 14 gr. 57 ſcr. 267014409 additum, conflabit 374512069 tangentem 75 gr. 3. ſcr.

Sed & hinc ordine retrogrado invenientur πυθμένες ex quibus tangens optata confletur, atque inde ipſius quantitas juſta quoque invenietur. Rem exemplo propoſito illuſtrabo, ut ſi quæratur tangens 89 gr. 55. ſcr. hoc modo primum reſolves

Dehinc ordine inverſo ita compones
Ad radium 10000000000.

	Gr. ſcr.	
89. 55	Tang. 4 40	816292849
Compl. 5		2
89 56		1632585698
Compl. 10	*Tang.* 42 40	9216968536
89 40	*Tang.* 47 20	10849554234
Compl. 20		2
89 20		21699108468
Compl. 40	*Tang.* 21. 20	3905540719
88 40	*Tang.* 68. 40	25604649187
Compl. 20		2
87 20		51209298374
Compl. 2 40	*Tang.* 10. 40	1883494802

 84 40

84 40	*Tang.* 79 20	53092793176
Compl. 5 20		2
79 20		106185586352
Comp. 10 40	*Tang.* 5. 20	933540099
68 40	*Tang.* 84. 40	107119126451
Comp. 21 20		2
47 20		214238252902
Comp. 42 40	*Tang.* 2. 40	465757485
Differ. 4 40	*Tang.* 87. 20	214704010387
		2
		429408020774
	Tang. 1. 20	232752583
	Tang. 88. 40	429640773357
		2
		859281546714
	Tang. 0. 40	116360535
	Tang. 89. 20	859397907249
		2
		1718795814498
	Tang. 0. 20	58178298
	Tang. 89. 40	1718853992796
		2
		3437707985592
	Tang. 0. 10	29088903
	Tang. 89. 50	3437737074495
		2
		6875474148990
	Tang. 0. 5	14544421
	Tang. 89. 55	6875488693411

Eſt itaque

Eſt itaque tangens $\overline{89}\ 55'$ 68754886934II, ut hac via non opus ſit majoribus ſinuum tabulis, aut ſinu toto, quam ſecundum quem ipſi ſinuum canones ſunt conſtituti.

XVII. Propositio.

Secans eſt recta ſuæ peripheriæ relativa, à centro ad verticem tangentis eiuſdem connexa.

VT in diagrammate Propoſit. 14. Si *ey* ſit data peripheria, tum *ei* erit ejuſdem tangens, & *ai* ſecans. ita *ou* eſt tangens peripheriæ *oy*, & *au* ſecans.

XVIII. Propositio.

Radius inter ſinum datæ peripheriæ & ſecantem complementi medio loco proportionalis eſt.

IN eodem diagrammate, datæ peripheriæ *ye*, ſinus *yr* ad radium *ay* ita ſe habet, ut radius *ao* ad ſecantem complementi *au*. Triangula enim *ary aou* ex definitionibus & conſtructione ſimilia ſunt.

XIX. Propositio.

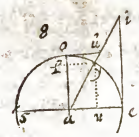
Secantes peripheriarum, earundem complementorum ſinibus reciproce proportionales ſunt.

ID ex præmiſſa manifeſtum eſt: datæ ſunto in diagrammate Propoſit. 15. *ey. el.* cum enim rectangulum ſub ſecante *ar*, & ſinu complementi *ny* comprehenſum radij quadrato æquale ſit, & quod ſub *ai* & *ml* eidem æquetur; erit ut *ml* ad *ny*, ita viciſſim ſeçans *ar* ad ſeçantem *ai*.

XX. PROPOSITIO.

Vt ſinus peripheriæ ad tangentem eiuſdem, ita tangens complementi ad eiuſdem complementi ſecantem.

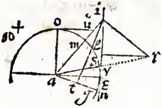
RECTANGVLVM enim à ſinu & ſecante complementi comprehenſum, æquatur radij quadrato, per propoſitionem antecedentem: at eidem quoque æquatur rectangulum è tangente, & tangente complementi ejuſdem; Et ipſæ lineæ ideò ſunt reciproce proportionales, nempe, ut ſinus ad tangentem peripheriæ datæ, ita tangens complementi, ad ejuſdem comp. ſecantem; hoc eſt in appoſito diagrammate, ſi *oy* ſit peripheria data, ut *ly* ad *ou*, ita *ei* ad *ia*.



Vel, ut *ly* ad *ou*; ita *ay*, id eſt, *ao* ad *au*, & ita *ei* ad *ia*, & ex æquo igitur; ut *ly* ad *ou*, ita *ei* ad *ia*.

XXI. PROPOSITIO.

Secans Peripheriæ maioris æquatur tangenti complementi plus duplo tangentis differentiæ, & tangente dimidij complementi.



SIT in ſchemate propoſito, peripheria data *me*, ejuſque complementum *mo*, ſecans *ai*, tangens *ie*, tangens compl. *ou*; ajo lineam *ai*, æquari tangenti *ou*

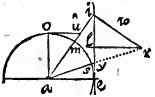
ti *ou* plus dupla tangente differentiæ *ſe*, inter datam & ejus complementum ſcilicet *ey*, & tangente dimidij compl. *om*, ſcilicet *en*: cum enim Propoſitio 16. oſtenſum ſit, lineas *il* & *ou* æquari, nec non *ly* & *ye* tangentem ſcilicet dimidij complementi; ſtatuatur peripheria *eg*, æqualis dimidio complementi *oam*, & proinde *en* æqualis ipſi *ey*, tangens nempe peripheriæ *eg*; Iam quia *ly ye* ſimul faciunt duplum tangentis peripheriæ *es*, *en* autem æquatur tang. dimidij complementi *oam*, dico totam *in* toti *ia* æqualem eſſe: cum enim in triang. *ain*, angulus ad *i* ſit complementum anguli ad *a*, propter parallelifmum linearum *ie* & *oa*, angulumque ad *e* rectum, dimittatur perpendicularis *it*; jam ang. *ati* rectus & *ait* complementum erit angulo *iat* aucto ſcilicet angulo *ean* qui dimidius eſt ipſius *oai*, ideoque *ait* erit quoque dimidium *oau*, & totus *ain* biſectus, & *tin* æqualis *tia* complementum anguli ad *n*; quocirca in triang. *ain* anguli ad baſin æquales, habebunt quoque crura *ai in* æqualia, fietque triangulum æquicrurum quod demonſtrandum erat.

Exemplum eſto tale, detur tangens peripheriæ *om* (complementi ſcilicet, *my* peripheriæ majoris cujus quæritur ſecans) 25 gr. 30 ſcr. 4769755, & tangens differentiæ *ſe*, 39 gr. o ſcr. 8097840, ejuſque duplum 16195680; tangens dimidij complementi 12 gr. 45 ſcr. 2262769: hi tres numeri additi, conſtituent ſummam 23228204, pro ſecante peripheriæ *me*, 64 gr. 30 ſcr. quæ à vera tantum unitate differt, unde patet aſſumendas eſſe tangentes majoris radij ne error ultimarum notarum in antecedentes vergat.

XXII. PRO-

XXII. PROPOSITIO.

Secans peripheriæ cum tangente, æquatur tangenti datæ dimidio complemento auctæ.



SIT enim in hoc diagrãmate peripheria data *es* tangens *ey*, complementum *eos* biſectum in *m*; ajo tangentem peripheriæ *em* æquari ſecanti datæ *ay* & tangenti ejuſdem *ye*. cum enim *oam mas* anguli æqualibus peripheriis inſiſtentes æquales ſint & ob paralleliſmum, angulus *aiy* angulo *oam*, hoc eſt angulo *may*: triangulum *ayi* ideo erit æquicrurum, & *ay yi* æquabuntur; tota igitur *ei*, ſecanti *ay* & tangenti *ye* æqualis eſt.

Vides itaque hac ratione ex tangente & tangente dimidij complementi, conflari ſimplici additione unam ſecantem & unam tangentem aliarum peripheriarum.

Sit data peripheria *ey* 15 grad. ejus tangens 26794919. complementi dimidij 37 36 tangens *ou* 76732699.

Tang. 37 30	76732699
Tang. 15	26794919
Secans 15	103527618
—	26794919
Tang. 52 36	130322537

Nam ſi addas utramque tangentem conflabitur ſecans peripheriæ datæ *ay*. quia *ay* & *iy* æquantur per Prop. 16.

Si iterum addas, dabitur tangens peripheriæ ex data & dimidio complemento conflatæ *ei*.

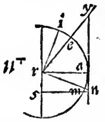
Magna res eſt, & tabularum Canonicarum compilatoribus admodum neceſſaria; Hac enim via datis

datis tantum tangentibus ordine ad gr.45. per ſingula ſcrupula, & tangentium tabula porrò tota, & ſecantium, ſola additione abſolvetur.

Sed & contra datâ ſecante aut tangente quacunque majoris peripheriæ, quam 45 gr. invenies ordine retrogrado πυθμένας ex quibus illi componantur per ſyntheſin, & ita illorum jam in Canonas relatorum ἀκρίβειαν explorare tibi licebit. Cujus rei haud abſimile exemplum Propoſitione 16. exhibuimus, ad cujus analogiam etiam iſtud haud difficulter explicabis. Potuit etiam huc illud adjici.

XXIII. PROPOSITIO.

Secans peripheriæ æquatur eiuſdem tangenti, & tangenti dimidij complementi.



DETVR in hoc diagrammate peripheria *ea*, ejuſque ſecans *ry* tangens *ya*; dimidium vero complementum arcus *ei* ſeu arcus *am*, ejuſque tangens *an*; dico lineam *ry* æquari lineæ *yn*: cum enim *irm* ſit quadrans circuli, & angulus rectus ad *r*, erit *ire* compl. anguli *yrm*, & æquale angulo *arm* ex ſtructura; ſimiliter ducta perpendiculari ad punctum *n*; angulus *rns*, æqualis erit angulo *ire*, ſeu *arn* ob paralleliſmum linearum *ra*, *sn*; Ergo ſi utrimque ab angulis rectis *irn*, *yns*, æquales angulos *ire* & *snr* auferas, erunt reſidui *yrn* & *ynr* æquales ideoque triang. *ryn* æquicrurum, & *ry* ſecans, æqualis *ya* tangenti & *an* tangenti dimidij complementi quod erat demonſtrandum.

Hinc jam facili calculo ex datis tangentibus totam

tam tabulam ſecantium deduces addendo ſimpliciter duas tangentes, cujus rei exemplum unicum ob oculos ponam; eſto invenienda ſecans 25 grad. poſito radio 100000,00 particularū, quæro itaque in tabula tangentium ejus tangentem 4663081, deinde tangentem dimidij complementi 32 grad. 30 ſcr. 6370702 quâ ad priorem addita conflatur 11033783 ſecans arcus propoſiti quam quærebamus.

Verum enimverò quemadmodum de horum canonum ſtructura compoſitione & origine abunde à nobis hactenus dictum eſt; ita nunc deinceps de ordine eorundem non nihil dicendum ſupereſt. Regiomontanus qui primus omnium Canonem ſinuum initio ad 6000000 inde ad 10000000 putare inſtituit, unicum duntaxat ſinuum canonem ordinavit, quemadmodum Hipparchus & Ptolomæus ſubtenſas. Inde Canonibus Tangentium & Secantium in abacos & epilogiſmum illatis, ſingulis ſeorſim ſuus locus eſt attributus, ut antea ſinibus; Inde oportunitas & utilitas omnes tribus ſelidibus conjungere docuit, ad 45 gradum paginâ ſiniſtra deſcendendo; hinc ordine retrogrado adſcendendo reliquos 45 gradus pagina dextra. Cujus oportunitatis autorem ante magnum illum Ioachimum Rheticum nominare habeo neminem. Porro autem ut paulò accuratius, rationem Canonum noſtrorum explicemus, ita habendum eſt. Cum tabulæ ad gradus & graduum ſcrupula duntaxat ſint ordinata, & uſu aliquando eveniat, ut etiam ad ſcrupulorum ſcrupula, quæ ſecunda vocant ſit ob ἀκριβείας deſcendendum; ſi in hoc caſu ſinus, tangentes & ſecantes inveſtiges, nullum unquam invenies ſcrupulis ſecundis reſpondentem, niſi per partem proportionalem inter minorem & majorem

majorem terminos in tabulis expreſſos, his ſcrupulorum particulis debitam differentiam inquiras, eamque pro datâ peripheria ita numeris in tabula inventis applices, ut ſinum, tangentem aut ſecantem quem quærebas legittimum exhibeat; verum ut hæc commodius intelligantur, docebimus propoſ. ſequenti

XXIV. Propositio.

Datæ peripheriæ ſinum, tangentem, vel ſecantem è tabulis invenire. Et contra; Dato ſinui, tangenti aut ſecanti debitam peripheriam invenire.

Cum enim in Canonibus noſtris ſinus, tangentes & ſecantes ad ſuas peripherias referantur, & contra ipſæ peripheriæ ad ſuos ſinus tangentes & ſecantes; ex altero reliquum inveniri oportet. Et primo quidem, ſit propoſitum ex data peripheria adſcriptam invenire, utpote ſinum anguli ſive peripheriæ 36 graduum 40 ſcr. In fronte tabulæ igitur numerum graduum inquires, in pagina ſiniſtra & in margine deſcendendo ſcrupula, & in communi concurſu invenies numerum 59716. ſinum quæſitæ peripheriæ, vel anguli in eam inſiſtentis. Eadem res eſt in tangentibus & ſecantibus.

Quod ſi major aliqua peripheria quam 45 graduum proponatur, numerum graduum in pagina dextra & minutorum ibidem quæres, quibus ut ante ſuus reſpondebit numerus.

At ſi propoſitæ peripheriæ etiam ſecunda adhæreant, per partem proportionalem inquiretur ſinus ei debitus; ut ſi quæratur ſinus 36 gr. 40 ſcr. 30 ſec. hic in ipſis tabulis actu non datur, ſed ſinus 36. gr. 40

gr. 40 ſcr. 59716. proximè minor, & ſinus 36 gr. 41. ſcr. 59739. proximè major, differentia eſt 24, inde proportio ut 1 minutum primum, ſive 60 ſecunda, ad differentiam 24, ita 30 ſecunda ad 12. qui numerus ad minorem additus, dabit 59728 ſinum optatum hoc radio 100000. Ita enim continuo ordine inſcriptæ ſunt comparatæ ut earum differentia, cum per ſingula minuta diſiunguntur, ſecunda legittime exhibeat, ad radium 10000000. Sed iſta nunc pluribus perſequi ſuperſedeo.

Si dato ſinu, vel tangente, vel ſecante, peripheria poſtuletur ei debita, hoc ſimili analogia inverſis terminis præſtari, nulli dubium eſſe poteſt aut obſcurum, qui antecedentia plane intellexerit.

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WILLEBRORDI

WILLEBRORDI SNELLI
A ROYEN, R.F.

DE CONSTRVCTIONE ET FABRICA CANONIS SInuum, *plenior & uberior commentatio.*

SINVM unius minuti quidam ut Regiomontanus Rheticuſque per continuam peripheriarum biſectionem inveniunt. Nam ſi ex ſubtenſa 60 gr. quæ eſt latus ſexanguli, & ſubtenſa 72 gr. quæ eſt latus quinquanguli; per propoſ. 9. conſ. 2. inveniatur ſubtenſa differentiæ, qui ſunt gradus 12. & per prop. 7. biſecando ſubtenſa gr. 6, & iterum ſubtenſa 3. gr. & hinc 1 gr. 30 ſcr. Id quidem certum eſt & indubitatum, duas ſubtenſas ſex graduum, majores eſſe ſubtenſa graduum 12. trianguli enim duo quælibet latera reliquo ſunt majora; atqui quanto longius procedes tanto tamen propius in poſita diametro, hi termini conſentient; at ſi majorem multo radium aſſumeres, jam differentia ſtatim ſe proderet. Idem de inſcriptarum ſemiſſibus, hoc eſt dimidiarum peripheriarum ſinibus Iudicium eſto, exemplo poſito rem explicabo: ſtatuatur enim ſinus totus 100000.00000.00000,

Gr.	'	"	tum Sinus erunt
6.	0.	0	1045284632.67653
3	0	0	5233.59562.42944
1	30	0	2617.69483.07873
	45	0	1308.95955.71344
	22	30	654.49379.67352
	11	15	327.24865.06526
	5	$37\frac{1}{2}$	163.62454.43624
	2	$48\frac{3}{4}$	81.81229.95607
	1	$24\frac{2}{8}$	40.90615.32028
		$42\frac{3}{16}$	20.45307.70292

In hoc ſyllabo vides ſinum 3. gr. bis ſumptum majorem eſſe ſinu gr. 6. & duplum ſinus 1 gr. 30 ſcr. majus eſſe ſinu 3 gr. atque ita deinceps in reliquis, ſed tamen quanto longius proceſſeris tanto minus illi termini inter ſe diſtant; Ita duplum ſinus o gr. o ſcr. $42\frac{3}{16}$ eſt 40.90615.40584. & ſinus o gr. 1 ſcr. $24\frac{2}{8}$ ſec. eſt 40.90615.32028. Vides itaque ſi radium aſſumas tantum decem notarum tum nihil peccari, ſi huius ſinus dimidium pro illo aſſumatur, & contra: quamobrem idem ille ſinus à ſinibus peripheriarum minorum quam duplo, ſuis peripheriis proportionaliter tantum diſtabit ſecundum hunc radium 1.00000.00000. Atque ideo ſi fiat ut $42\frac{3}{16}$ ſecunda ad 60 ſecunda, ita ſinus 20.45307.70292, ad 29.08882.06637. qui ſinus eſſet unius ſcrupuli, ſed ut monuimus quinque notæ ſunt à fine deterendæ ut reliquæ 2908882. legittimus ſint ſinus poſito radio partium 1000000-0000, Quamobrem ut condas canonem cujus ſinus totus ſit octo notarum hic jam ſatis ſit: nam ut jam ante monuimus ob multiplicem calculum paulo major inſtitui debet, ut opere confecto una aut

altera

altera nota à fine dempta, reliqui numeri ſani ſint & legittimi.

Alijs etiam Algebrica analyſis placuit, ut clariſſimis viris Franciſco Vietæ & Adriano Romano: cum enim poſſit Geometrice inveniri ſinus 3 graduum id enim ante jam eſt oſtenſum; non autem poſſit peripheria Geometrice triſecari ut habeatur ſinus unius gradus aut etiam quintuſecari: Algebra in partes vocata eſt, & per compoſitionem propoſitionis 9, eo deventum, ut pronunciarent ſi ſinus totus ſtatuatur partis 1, tum tres inſcriptas peripheriæ ſubtriplæ, multatas ejuſdem cubo, æquari inſcriptæ peripheriæ triplæ: vel in notis algebricis hoc modo 3l--- 1c. ut ſi detur latus ſexanguli 1, & quæratur ſubtenſa triplæ peripheriæ quæ hoc caſu eſt ipſa diameter; triplum unitatis ſunt 3, cubus ejuſdem 1, hic numerus de illo deductus relinquit 2 ipſam diametrum, quemadmodum oportuit. Eſto aliud, detur latus inſcripti quadrati $\sqrt{2}$, cjus triplum $\sqrt{18}$, ejuſdem cubus $\sqrt{8}$. differentia horum $\sqrt{2}$. ut oportuit: nam latus quadrati & quadrantem & dodrantem peripheriæ pariter ſubtendit.

Sed è tabulis nobis numerus aſſumatur & è ſubtenſa graduum 4 ea eſt $\frac{697990}{10000000}$ quantarum diameter erit partium 2: illius triplum $\frac{2093970}{10000000}$, ejuſdem cubus $\frac{3401}{10000000}$. qui de illo deductus relinquet $\frac{2090569}{10000000}$ pro ſubtenſa peripheriæ 12 gr. atque ideo 1045284 eſſet ſinus gra. 6. qui verè eſt 1045285. quod inde eſt quia nimis arctos initio aſſumpſi numeros ut non ſit mirum ultimam notam in lubrico verſari.

At non hoc tam quæritur, quám ejus converſum, Quomodo ex data ſubtenſa, inveniatur ſubtenſa

peripheriæ ſubtriplæ : hic iſta æquatio jam ad analyſin eſſet revocanda, quod omnibus non æque eſt expeditum: ejus itaque locum alea regulæ falſarum poſitionum nobis ſupplebit, quam etiam in difficillimis æquationibus explicandis, magno cum fructu à magnis viris, tanquam arcanum aliquod adhibitam optimè ſum conſcius ; Sed & idem in ſua Trigonometria peroportune quoque monuit Pitiſcus. Verum ne longe diſcedamus;cum inſcripta peripheriæ ſubtriplæ paulo major ſit triente inſcriptæ triplæ peripheriæ, primum trientem aſſumam datæ inſcriptæ, aut potius numerum pauxillo triente majorem. Sit itaque data 6 gr. inſcripta $\frac{10467191}{100000000}$ & quæratur inſcripta 2 grad. ea fingatur nobis $\frac{3491000}{100000000}$ neque enim neceſſe eſt omnes numeros ſignificantes primo experiunti aſſumere. Hujus cubus eſt $\frac{4254}{100000000}$ qui de triplo inſcriptæ fictæ duorum graduum $\frac{10473000}{100000000}$ deductus, relinquet $\frac{10468746}{100000000}$ pro inſcripta 6 gr. atqui ea vera erat $\frac{10467191}{100000000}$. igitur fictæ poſitionis exceſſus eſt $\frac{15555}{100000000}$.

Aſſumatur itaque minor numerus pro inſcripta 2 gr. $\frac{3490000}{100000000}$ hujus cubus $\frac{4258}{100000000}$ à triplo inſcriptæ deductus relinquet $\frac{10465749}{100000000}$, minorem vera 6 gr. inſcripta $\frac{1442}{100000000}$. formula hæc erit

3491000	+	1555	facti	5426950000
3490000	−	1442		5034022000
		2997		10460972000

quia ſunt ſigna diverſa fit additio, itaque 10460972000 per 2997 diviſus dabit $\frac{3490481}{100000000}$ inſcriptam duorum graduum; quæ ex majoribus tabulis datur accurata $\frac{349048128}{10000000000}$. ecce itaque in notis octo veritatem conſtantem. Quod ſi iterum libeat eodem modo

modo experiri ad 13 aut 14 notas pervenies ex hoc invento; Eadem in alijs via: Certitudinem arguet regreſſus per compoſitionem ſecundum conſect. 1 prop. 9. vel ſane ut jam fecimus ipſe cubus à lateris triplo ſubductus; qui tum inſcriptam triplæ peripheriæ accurate reſtituet.

Ad datæ peripheriæ quintuſectionem, hoc eſt ut data datæ peripheriæ inſcripta, inveniatur inſcripta quæ ejuſdem peripheriæ quintæ parti ſubtenditur, ex eodem conſectario 1 propoſ. 9. hanc æqualitatem invenies; ut poſita ſemidiametro partis 1. tum 5l----5c † 1ß æquatur inſcriptæ quintuplæ: Nempe ſi ad inſcriptæ datæ quintuplum addatur ſolidus primus ejuſdem, & hæc ſumma multetur quintuplo cubi ab eadem inſcripta, ille erit numerus debitus inſcriptæ quintuplæ: Exemplum tale eſto ſubtenſa 60 gr. eſt 1 quæritur ſubtenſa peripheriæ quintuplæ nempe 300 gr. quintuplum inſcriptæ datæ 5, auctum ſolido ab eadem 1 eſt 6, inde quinque ejuſdem cubi deducti relinquunt 1, pro ſubtenſa 300 grad. quod omnino verum eſt, quia inſcripta ad utramque peripheriam pariter refertur.

Verum eſto etiam aliud, ſubtenſa 12 grad. eſt $\frac{2090569}{10000000}$ & quæritur ſubtenſa peripheriæ quintuplæ, nempe grad. 60. dati numeri cubus $\frac{91370}{10000000}$, ejus quintuplum $\frac{456850}{10000000}$. hinc ipſius inſcriptæ quintuplum $\frac{10452845}{10000000}$, ad ejus ſolidum primum nempe $\frac{3995}{10000000}$ additum, conflabit $\frac{10456840}{10000000}$, unde cubi quintuplum ſubductum relinquet $\frac{9999991}{10000000}$ pro inſcripta 60 gr. ubi vides ultimam notam ex operis varietate lubricam; oportuit itaque radium una aut altera nota

 majorem

majorem aſſumi : nam inſcripta 60 gr. debuit radio aſſumpto æquari.

At contra illud potius quæritur, quomodo data inſcripta peripheriæ quintuplæ, inſcripta peripheriæ ſubquintuplæ ſubtenſa inveniatur ; Id vero eadem alea qua in triſectione uſi ſumus tibi erit experiundum : Sit enim propoſita peripheria 85 gr. 20 ſcr. cujus inſcripta detur $\frac{135546\,39982}{100000.00000}$ & quæratur inſcripta 17 grad. 4 ſcr. qui ſunt datæ peripheriæ pars quinta. Aſſumamus itaque terminum hujus quinta majorem, & quidem nunc ſatis parcè, ut quantum hac ratione proficiatur ex iſta analogia ſemper conſtare poſſit. Et primò quidem fingamus ſubtenſam quintæ parti eſſe $\frac{29600000}{100000000}$ ejus cubus $\frac{2593433}{1000000000}$, hujus quintuplum $\frac{12967168}{100000000}$. eiuſdem lateris ſolidus primus erit $\frac{227226}{100000000}$ qui ad lateris quintuplum $\frac{148000000}{100000000}$ additus conflat $\frac{148227226}{100000000}$. inde ſupraſcripti cubi quintuplum deductum relinquit $\frac{135260058}{100000000}$, pro inſcripta quintuplæ peripheriæ ſubtenſa; Atqui ea fuit data $\frac{135546400}{100000000}$. inventa itaque ab hac deficit $\frac{286342}{100000000}$.

Et ſecundo eadem inſcripta peripheriæ ſubquintuplæ ſubtenſa aſſumatur $\frac{29700000}{100000000}$, hujus cubus erit $\frac{26198073}{1000000000}$ ejuſdemque quintuplum $\frac{130990365}{1000000000}$. Et eiuſdem lateris ſolidus primus $\frac{231000}{100000000}$, qui ad quintuplum lateris $\frac{148500000}{100000000}$ additus, conflat $\frac{148731000}{100000000}$. Cujus exceſſus ſupra quintuplæ peripheriæ inſcriptam ex hypotheſi primo datam, eſt $\frac{85654}{100000000}$: ſecundum regulæ falſarum poſitionum præcepta formula hæc erit,

			facti
29600000	−	286342.	8504347400000
29700000	+	85654.	2535358400000
		371996.	11039705800000

atque

atque hinc peracta diviſione dabitur inſcripta quintæ parti ſubtenſa $\frac{29676947}{100000000}$, quæ eſſet $\frac{29676954}{100000000}$, ut è tribus ſanis jam ſex ſint integri inventi : ſi ultra pergeres, rurſum numerus ſanus iſtius eſſet duplus , nempe ad minimum ad radium notarum duodecim, tu ſi libet porrò periculum facito. Hinc jam porro continua biſectione inſcriptam duobus ſcrupulis ſubtenſam invenire licet per ea quæ ſupra à nobis expoſita ſunt præcepta.

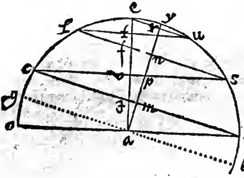
Sed & novum hoc atque perjucundum acroama quoque accipe ; ut ſinus quoſcunque , & quorumcumque polygonorum latera ſola additionis via invenire poſſis : & quidem è numeris fortuitis; ego cum in iſta incidi aliud animo agitabam , quemadmodum è ſolis ſinibus mera additione tangentes & ſecantes aliquot exſculpi poſſint , ſed

----- amphora cœpit
Inſtitui, currente rota cur urceus exit?

Profecto commentum mihi perplacet , neque quidquam omnino eſt cauſæ cur tibi diſplicere poſſe exiſtimem. quamobrem animum advorte, & hac tam expedita facilitate tete oblectato , vel in ipſo vaſto mari, aut remotiſſima ſolitudine ſi ita res exigat : cum ea factio vel puero ſemper in promptu eſſe poſſit.

I. PROPOSITIO.

Sinus peripheriarum æquali cremento à quadrante decreſcentium, ordine proportionales ſunt differentijs ſinuum, qui pertinent ad peripherias eodem cremento increſcentes, quarum prima ſit ipſius crementi ſemiſſis.



EXPONATVR circuli quadrans *eai*, & aſſumantur in eo peripheriæ æquales *is su ue*, & biſecetur *eu* ultima in *y*, & compleatur ſemicirculus *ieo*, & ſunto *oc cl le* primis æquales, inſcriptæ igitur *lu, cs* diametro *oi* parallelæ & ab *ea* radio erunt biſectæ, & cum *uy* ſit dimidia peripheriæ *eu* vel *us*, erit ea dimidium crementi *us* vel *si*, ſintque eidem *uy* æquales *ib* & *cg*: hinc connectantur *eu ls ci*, quæ radio *ay* perpendiculares, ab eodem biſecantur: & *yu ys yi* peripheriæ vel potius *bi, bs, bu*, jam pari cremento increſcunt; atque harum prima *yu* eſt dimidium ipſius crementi in utroque ordine: Ajo ſinus primarum peripheriarum *su ey*, quæ à quadrante decreſcunt, proportionales eſſe differentiis ſinuum qui eodem quidem cremento increſcunt, ſed ita ut prima ſit crementi ſemiſſis, quæ hic ſunt *bi bs bu*, hoc eſt, ut *sv* ad *nt*, ita *wn* ad *nr*, cum enim rectangula triangula *eut flt*, habeant

habeant latera *lt tu* æqualia, & anguli ad *u* & *l* in æquales peripherias inſiſtant erunt ſimilia, & præterea æquilatera ut *et tf* ideo æquentur; ſic *fv* & *vʒ* æquantur, & *ltf ſsv* triangula ſunt ſimilia: erit itaque *sv* ad *tu*, ut *fv* ad *te*, & ut dupla *ʒf* ad duplam *fe*, ſed ut *ʒf* ad *fe*, ita ob parallelismum interſecantium erit *mn* ad *ny*, quod erat oſtendendum. Sed numeris idem illuſtrare libet, ſit in expoſito diagrammate *es* 85 gr. *eu* 80 gr. *uy* dimidia differentia cui æquator *bi* 2 gr. 30 ſcr. *bs* 7 gr. 30 ſc. *bu* 12 gr. 30 ſcr.

85 gr.	9961947. *sv*	2 gr. 30 ſcr.	439194.	*am.*
80 gr.	9848077. *tv*	7 gr. 30 ſcr.	1305262.	*an.*
		12 gr. 30 ſcr.	2164396.	*ar.*

erit igitur ut 9961947, ad 9848077, ita differentia inter *am* & *an* 869068, ad differentiam inter *an* & *ar* 859134. quod omnino verum eſſe calculus comprobat.

II. PROPOSITIO.

Vt radius ad ſinum dimidii crementi, ita duplum ſinus complementi totius crementi, ad differentiam inter ſinum dimidij crementi & ſeſquipli eiuſdem. Et ita duplum ſinus complementi dupli crementi, ad differentiam inter ſinum ſeſquipli & ſinum dupli ac ſeſquipli crementi. Atque eo porrò ordine per unius crementi intervallum continuando.

CUM enim triangula *iam*, *cpm*, *spn*, ſint ſimilia, ut jam ante patuit, erit ut *ia* ad *am*, hoc

eſt ut ſinus totus ad ſinum dimidij crementi in eodem diagrammate, ita *cp* ad *pm*, & ita *ps* ad *pn*. & propterea per compoſitionem, ut *ia* ad *am*, ita *cs* ad *mn*. Sed *es* eſt complementum crementi *is*, ejus ſinus *vs*, cujus duplum *cs*, atque *mn* eſt differentia inter *am* ſinum dimidij crementi *bi*, & ſinum ſeſquialterius *bs*, cui debetur ſinus *an*.

Haud aliter reliqua demonſtrabis, eſſe nempe quemadmodum *ia* ad *am*, ita *uc* ad *nr*.

CONSECTARIVM.

Itaque

Licet hinc datis ſinibus quotcunque, à quadrante æquali intervallo decreſcentibus, & ſinu dimidiæ differentiæ, ſola multiplicatione & additione invenire ſinus, qui ad dictarum differentiarum loca intermedia pertinent.

	gr.	ſinus	duplum
Dentur enim ſinus expoſitarum peripheriarum	84	9945219.	19890438.
	78	9781476.	19562952.
	72	9510565.	19021130.
	66	9135455.	18270910.
	60	8660254.	17320508.

Peripheriæ datæ increſcant continuè per gr. 6. cujus dimidium 3 gr. & ejus ſinus 523360,

Fiat itaque ut ſinus totus 10000000, ad ſinum dimidiæ differentiæ 3 gr. 523360,

Ita duplum ſinus 84 gr. 19890438, ad	$1040985\frac{9}{10}$
& duplum ſin. 78 gr. 19562952, ad	$1032846\frac{6}{10}$
& duplum ſin. 72 gr. 19021130, ad	$995489\frac{8}{10}$
& duplum ſin. 66. gr. 18270910, ad	$956226\frac{2}{10}$
& duplum ſin. 60 gr. 17320508, ad	$906486\frac{1}{10}$

qui

qui continuè ad ſinum dimidij crementi 3 gr. additi, dabunt ſinus qui pertinent ad 3 & 6, 3 & 12, 3 & 18, 3 & 24, 3 & 30. hoc eſt 9 15 21 27 33 graduum hoc modo.

Omnes hi numeri ita accuratę congruunt prout ſinit partium ſymmetria: nam ultima nota fuit lubrica initio à nobis aſſumpta: itaque mirum eſſe non debet ſinum 27 gr. 4539908, tantum ad radium ſex notarum omnino eſſe legittimum.

3 gr. ſinus	523360	
	1040985	9
9 gr. ---	1564345	9
	1023846	6
15 gr.	2588192	5
	995489	8
21 gr.	3583682	3
	956226	3
27 gr.	4539908	6
	906486	1
33 gr.	5446394	7

Quamobrem ex iſto conſectario id commodi etiam ſinuum canoni accedit, ut ſingulis multiplicationibus, ſinguli iſti ſinus exhibeantur, quos alioquin ſecundum adſcripti quadrilateri affectiones per propoſ. 9. hujus libri inveſtigarę debebas.

Hac igitur via datis ſinibus 225, intervallo 16 ſcrupul. à quadrante decreſcentibus, cum ſinu dimidij crementi 8 ſcr. dabuntur iſti quos hic ſuis peripherijs expreſſos ſubjicimus: nempe ſi dentur, ſinus, —— —— —— —— 89 44′

Et dato inſuper ſinu 8 ſcr. quæ ſunt dimidium crementum, dabuntur quoque ea methodo quâ ſupra ſinus

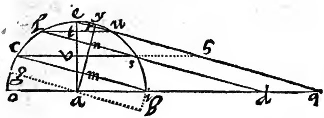
	89 44′
	89 28
	89 12
0 24′	88 56
0 40	88 40
0 56	88 24 &c.
1 12	
1 18	
1 44	

Atque

Atque ita porrò ſervato eodem cremento. Iam ex inventis hiſce

III. PROPOSITIO.

Si quotcunque peripheriarum æquali differentia increſcentium, radij ſemiſsis ſtatuatur ſinus dimidij crementi, ſinus complementi totius crementi illi additus fiet ſinus ſeſquicrementi: & huc ſinus complementi dupli crementi aggregatus dabit ſinum dupli & ſeſquipli crementi; atque ita eodem porrò ordine, cuius radius è complementorum quadratis invenitur.



ETENIM ut ante peripheriæ *yu ys yi* æqnali creſcant intervallo, & ſit *yu* æqualis crementi dimidio, eidemque ſtatuatur æqualis *ib*: & ſunto inſcriptæ eodem modo ordinatæ ut prius: ſed inſcriptæ *eu ls* occurrant diametro continuatæ in *q* & *d*; & *cs* continuata ipſi *eq* in *h*. Erunt itaque *am an ar* ſinus *ib* dimidij crementi, *bs* ſeſquicrementi, *bu* dupli & ſeſquicrementi proportionales, ob parallelliſmum interſecantium, rectis *ai*, *ad*, *aq*. atqui *ai* eſt radius ipſe; *ad* ex radio & *cs*; *aq* ex radio *ai* & *cs* & *lu* compoſita; quare iſtarum dimidia erunt in ratione ſinuum *am*, *an*, *ar*, dimidii nempe crementi & ſeſquialterius, & dupli ſeſquialterius. Sed ad

ſuum

ſuum radium qui ex complementorum quadratis inveniri debet.

Sit itaque crementum *is* 30 gr. & ideo *yu* vel *bi* 15 gr. *bs* 45, *bu* 75, & erit ordo hujuſmodi

	aſſumatur	ſin.compl.	dimid.	ſinus	
is	30 gr.	8660254	*ai.*	5000000	15 gr.
iu	60 gr.	5000000	*ad.*	8660254	45 gr.
			aq.	13660254	75 gr.

radij novi quantitatem habebis ex duplo quadrato 45 grad. vel ex quadratis 15 & 75 grad. Sed eſto exemplum paulo luculentius; crementum ſit 6 gr. 40 ſcr. ergo dimidium 3 gr. 20 ſcr. diſponam itaque peripherias à maxima decreſcentes, & earum adſcribam ſinus, inde addendo componam ut habeam omnes dimidiarum, ſeu impares intermedios, ut hic.

		Ex horum additione ad dimidium radium, exiſtunt novi ſinus peripheriarum à dimidio cremento eodem, quo iſtæ intervallo increſcentium: ſed ad novi radij æſtimationem.	3 26	5000000
83 26	9932384		10 0	14932384
76 40	9730450		16 40	24662838
70 0	9396926		23 20	34059760
63 20	8936327		30 0	42996087
56 40	8354878		36 40	51350965
50 0	7660445		43 20	59011410
43 20	6862417		50 0	65873827
36 40	5971586		56 40	71845413
30 0	5000000		63 20	76845413
23 20	3960799		70 0	80806212
16 40	2868033		76 40	83674245
10 0	1736482		83 20	85410727

Vides itaque hic ſecundum demonſtrata exhiberi novos ſinus ad alium radium comparatos: & quia hic caſu incurrimus in trigeſimum quoque

gradum,

gradum , ſinus ei è regione poſitus erit radij dimidius 42996087 , ut totus ſit 85992174. quod ſi non incurreret in 30 gr. hic ordo, tum ex complementis cum invenires, quæ hoc caſu nunquam dantur. Quin adeo ex hoc opere adeo accuratus datur omnium numerorum conſenſus ut longius horum novorum ſinuum ἀκρίβεια producatur , quam ad radium qui ab initio erat aſſumptus.

Exemplum in his pauculis nobis unicum duntaxat eſto. Cum ſinus 30 grad. datur in inventis 42996087. tum ſinus totus eſt 85992174 , & ſinus 43 grad. 20 ſcr. 59011410. Itaque ſi ſinus totus ſit particularum 10000000000. ſinus 43 gr. 20 ſcr. ſecundum hanc analogiā debitus erit 6862416260, ubi nobis tabulæ Rhetici ſuppeditāt 6862416379. Vides itaque canones minores 7 notarum hic errare, qui nobis exhibent 6862417. Atqui noſtri termini ex illis derivati ſunt, & tamen ſuis aboriginibus ſunt ſaniores & magis integri : Certe hujus factionis conſenſus adeo eſt accuratus ; ut vix dici queat ; cauſam ſi quæras mera hic eſt terminorum additio ; non ſimilitudo aut proportio , quæ integritatem ſuam non poteſt ultra producere quam rationum termini , qui ab initio erant conſtituti, at in additione ſecus eſt , quod ipſum experientia & uſus infra luculentiſſime comprobabunt. Sequitur theorema ejuſdem analogiæ & factionis etiam alterum,

IV. Pro-

IV. PROPOSITIO.

Si peripherijs pari cremento auctis ultima quidem quadranti, prima autem cremento æqualis ſit, horum ſinus eam habebunt rationem, quam ſinus peripheriarum, quarum prima maxima ſit quadrans minus dimidio cremento, reliquæ autem ordine per idem crementum decreſcant, donec ultima crementi dimidio ſit æqualis.

VT in eodem diagrammate quadrans *ie* in tres æquas partes eſt tributus, quarum prima ſit *is*, hujus dupla *iu*, tripla *ie*. Et cum *yb* quoque quadrans ſit & *ib* dimidio cremento æqualis, peripheriæ ſecundæ erunt *yi*, *ys*, *yu*. Vides itaque *hq* inſcriptæ *ci*, *hu* ipſi *ls* æquari, ob paralleliſmum: atqui ob parallelas *aq*, *vh*, *tu*, quoque proportionales ſunt lineæ *qh*, *qu*, *qe*, rectis *au*, *at*, *ae*, qui ſunt ſinus peripheriarum *is iu ie*. atque ideo *qh* erit ſinus peripheriæ *si*; *qu* ex *ci* & *ls* compoſita, ſinus *iu*: denique *qe* ipſe radius, ad quem illi ſinus comparantur. Quod autem de inſcriptis *ci*, *ls*, *eu*, verum eſt, idem quoque de earundem ſemiſſibus hoc eſt ſinibus *mi sn ur* verum eſſe conſtat: additis igitur ſinibus theorematis noſtri argumentum quoque ſtabit.

Atque hinc novus condendi canonis modus ad radium majorem, idque per ſolam additionem, ex datis ſinibus ad taxationem radij minoris. Exemplum primum ex ipſo diagrammate petatur, et ſit *ei* 90, *es* 60, *eu* 30. Iam *yi* 75, *ys* 45, *yu* 15, hoc modo.

Gr.	ſinus	Hi additi à maximo incipiendo dabunt ſinus peripheriarum.			
yi 15	2588190		90	19318516	*qe.*
ys 45	7071068		60	16730326	*qu*
yu 75	9659258		30	9659258	*hq*

Hic ſinus quadrantis dimidio cremento multati nempe 75 gr. primum fit ſinus totius crementi 30 gr. reliqui ordine additi, ſinus dupli & tripli crementi exiſtunt, donec totus quadrans expleatur.

Atque hic quidem ſi numerus partitionis ſive crementi in triginta incurrat, ut hoc loco ubi primus eſt; ultimus qui pertinet ad nonaginta hujus erit duplus, ut in iſtis hoc loco inventis 9659258 & 19318516. quare ille eſt dimidius radius, hic totus ad quem tales ſinus comparantur. Eſto exemplum ſecundum ubi totum crementum aſſumatur 22 gr. 30 ſcr. dimidium 11 gr. 15 ſcr. operis ratio hæc erit.

	ſinus		
78 45	9807853	22 30	9807853
56 15	8314696	45 0	18122549
33 45	5555702	67 30	23678251
11 15	1950903	90 0	25629154

Hic rurſum ſinus 78 grad. 45 ſcr. qui eſt quadrans dimidio cremento multatus, fit ſinus crementi 22 gr. 30 cum radius erit 25629154. hujus radij integritatem licebit experiri è complementorum quadratis.

Sed eſto exemplum paulo luculentius, & aſſumatur totum crementum 10 gr. dimidium 5, & iſta erit operis facies

ſinus

	Sinus		ſinus novi
85	9961947	10	9961947
75	9659258	20	19621205
65	9063078	30	28684283
55	8191520	40	36875803
45	7071068	50	43946871
35	5735764	60	49682635
25	4226183	70	53908818
15	2588190	80	56497008
5	871557	90	57368565.

Hic ut ſupra ſinus crementi 10 gr. ſtatuitur ille qui eſt in tabulis ſinus 85 gr. hoc eſt quadrantis ſemicremento multati; reliqua ut in proceſſu videre eſt ex antecedentiū additione exiſtunt: & ſinus 30 graduum hic datur 28684283; ſinus 90 ſeu radius 57368565 duplus antecedentis quemadmodum oportuit. Sed poteſt hoc opus ſæpius continuari, & ita multiplici iteratione è ſinibus ad parvum radium conſtitutis, ijdem in multo majoribus notis inveniri. Exemplum tale eſto, crementum ſit 15 gr. dimidium itaque 7. gr. 30 ſcr. unde operis facies ſurget hujuſcemodi

	Sinus		ſinus novi
82 30	9914449	15	9914449
67 30	9238795	30	19153244
52 30	7933533	45	27086777
37 30	6087614	60	33174391
22 30	3826834	75	37001225
7 30	1305262	90	38306487

V. PROPOSITIO.

Peripheria in partes quotcunque æquales diviſa, ita ut hæc partitio in 30 gr. quoque incurrat, ex datis ſinibus locorum imparium, dabuntur ſinus locorum parium ad novum radium. & contra, ex paribus impares.

SCITVM theorema, & quod uſum percommodum nobis præſtet, ut ex quibuſvis numeris, etiam contingentibus tamen legittimi ſinus exſculpantur. Sed primum theorematis veritatem in numeris veris ſecundum demonſtrata experiamur. Exemplo noviſſimo inventi ſunt ſinus 15,30,45, 60,75, ad radium 38306487. ubi ſinus triginta gr. quoque datur 19153244. hic ſi ſtatuatur ſinus dimidij crementi, reliqui ſinus ordine additi ſecundum propoſitionis 3 præcepta, fient ſinus ſeſquicrementi, & dupli ſeſquialterius, atque ita porro per loca imparia ad finem uſque progrediendo ut hic vides.

15	9914449	82 36	145483330	15	145483330
30	19153244	67 30	135568881	30	281052211
45	27086777	52 30	116415637	45	397467848
60	33174391	37 30	89328860	60	486796708
75	37001225	22 30	56154469	75	542951177
90	38306487	7 30	19153244	90	562104421

Atque ita porrò ſecundum præcepta propoſitionis tertiæ, & quartæ continuando, donec radius tot ſit notarum, quot poſtulabis. Hic ex ſinibus notarum ſeptem, tertia additione habemus ſinum ad radium

radium 100000.0000: nam ſi fiat ut radius 5621-04421 ad ſinũ 75 gr.5429511177 ita 10000000000 ad 9659258257 cum ſinus verus ſit 9659258263; vides itaque ad novem notas hos numeros eſſe ſanos? neque ultra integri eſſe poſſunt quia ipſe radius novus non habet notas plures: quod ſi libeat adhuc ſemel hanc viciſſitudinem iterare habebis eos legittimos ad radium notarum decem hoc modo

82	30	28105221	15	2134803485
67	30	82400338	30	4124123640
52	30	1310800096	45	5832391584
37	30	1708267944	60	7143191680
22	30	1989320155	75	7967195068
7	30	2134803485	90	8248247279

Hujus factionis modus adeo verus eſt, ut licet numeros aſſumas à veris ſinibus quantumvis alienos, modo ſinus 30 gradui attributus ſit dimidius ejus qui 90 adſcribitur, tamen omnes numeri paulatim in ordinem cogantur, & tam ſani ſinus exiſtant, quam qui ex arte legittimè ad datum quemcunque radium derivari poſſunt; tantus eſt huius reciprocationis conſenſus, ut paulatim τὰ νοθεύοντα excernat, & repudiet. Exemplum eſto κίβδηλον & ſunto ſinus fictitij, hoc modo

D 2 Periph.

Periph.	ſin.	Periph.	ſin.	ſin.	
15 6	24	82 30	360	360	5282
30 0	48	67 30	336	696	4922
45 0	68	52 30	288	984	4226
60 0	82	37 30	220	1204	3242
75 0	90	22 30	138	1342	2038
90. 0	96	7 30	48	1390	696
	1		2	3	4

ſin.		ſin.	
5282	77502	77502	1137246
10204	72220	149722	1059744
14430	62016	211738	910022
17672	47586	259324	698284
19710	29914	289238	438960
20406	10204	299442	149722
5	6	7	8

1137246	16687790	16687790
2196990	15550544	32238334
3107012	13353554	45591893
3805296	10246542	55838435
4244256	6441246	62279681
4393978	2196990	64476671
9	10	11

244874467	244874467
228186677	473061144
1959483431	669009487
150356450	819365937
94518015	913883952
32238334	946122286
12	13

Atque ita deinceps; operis autem accuratam veritatem, & quatenus ea procedat in ſedibus numerorum imparium, prout eos hic exhibemus (nam à toto cremento, quod per 30 gradus tranſit, initium fecimus) oſtendet conſenſus ſinuum qui ad 90 & 30 gradus pertinent: nam quoad hic duplicatus illum reſtituit, tantiſper omnes notas ſanas & legitimas eſſe tibi ſit perſuaſiſſimum; ut loco ſelidis decimętertię ultimo ſinus totus datur 946122286, ſinus autem 30 grad. 473061144, cujus duplum 946122288; pronuntio itaque tuto ad radium 94612228 omnes notas bene eſſe accuratas; exemplum ſit in 75 gr. cujus ſinus in eadem ſelide datur 913883952; & ſit ut 946122288 ad 913883952, ita 10000000000 ad 9659258254, ut duo noviſſimi tantum peccent, qui ſunt 54 pro 63, & in novem notarum radio, vix una unitate abeamus à vero diverſi, quod ante monueramus ex conſenſu ſinus 90 & 30 graduum. Quin adeo hæc factio ita accurata & vera eſt, ut licet omnes ſiuus ordine inverſo ſtatuas, & majores ſinus minoribus peripherijs, atque minores majoribus attribuas; tamen poſt multiplicem additionum viciſſitudinem inde integri & le-

gittimi exiſtant, modo leges poſitas ſequaris & ſinus 30 gr. ſtatuatur dimidius ejus qui ad 90 grad. pertinet, res experiunti erit haud difficilis.

Quamobrem ad canonis ſinuum concenturiationem parata & facilis eſt nobis via: Nam ſi prior ordo per ſcrupulorum paria inſtituatur, ut 2, 4, 6, 8, 10, alter loca intermedia explebit 1, 3, 5, 7, 9. atque ita porrò; res ex antecedentibus manifeſta eſt, ut 2700 additiones reciprocando, tam accuratos canones exhibere poſſis quam tibi erit collibitum: atqui cum radius hic alius ſit, quam vulgò uſitatus, hos ſinus ad milleſimas vel diviſionis vel multiplicationis via reduces.

Verum enimverò ne adeo vaſtum pelagus nullo duce, & quaſi fortuitò ingrediaris, quamvis etiam ita ad portum deſtinatum occultis legibus neceſſario proveharis; tamen expediet aliquam adhibere huic operi cynoſuram, quo facilius ex his tricymijs & undarum agitationibus moleſtis, navem in portu incolumem conſtituas. Oportunum itaque erit ſaltem ſingulorum graduum, aut etiam quod non improbē ſemiſſium, ſinus jam ante legittimos ut minimum ad radium quatuor notarum inveniſſe, atque inde ſecundum hanc differentiam proportionaliter ſinuum quantitatem per bina ſcrupula ordinare. Hac enim via, ſecunda additione facile ad radium ſex aut ſeptem notarum legittimos ſinus exſculpes, & ſi eandem viciſſitudinem ſecundo iteres, jam ad 10 aut 11 notas facile pervenies; conſenſum arguet ſinus 90 gr. cum ſinu 30 gr. comparatus, Sed priuſquam hic manum tollam de tabula etiam lateris cujuſcunque polygoni inventionem, mihi hac eadem via docendus es: quam utique inter extrema hujus theorematis merita, haud reponendam cenſeo.

VI. PRO-

VI. Propositio.

Dati cuiuſcunque polygoni latus vero tam propinquum invenire, quam cuique erit collibitum.

Et hæc mantiſſa non eſt negligenda; namque ita vitato intricatiſſimo aliquando opere, ſimpliciſſimè ad veritatis adyta nobis aditus aperitur. Sed hoc mihi ante omnia es monendus numerum polygoni & à 3 & à 2 debere eſſe dividuum. Et à binario quidem ut ejus latus ſemicirculum accurate obeat, & dimidium lateris ſit ſinus; hinc à ternario ut peripheria ſemiſſi debita in 30 gradum quoque incurrat. Atque ideo aliquando datæ figuræ ſextuplum erit aſſumendum, aliquando duplum, aliquando triplum, prout numerus laterum hujus ſectionis erit capax. Sed exemplis res erit illuſtrior.

Sit inveniendum latus dodecanguli, ejus dimidium 6, ergo ſinus dodecanguli ſextam quadrantis partem ſubtendit; nempe 15 grad. Atque ideo hujus progreſſum ita ordinabo per 15 gr. 30 gr. 45 gr. 60 gr. 75 gr. 90 gr. & ſinus 15 gr. erit dimidium latus ſexanguli, & hoc opus propoſitione antecedente à nobis eſt exhibitum.

Eſto etiam aliud & quæratur latus nonanguli, cumque numerus 9 non ſit à 2 dividuus aſſumatur eius quadruplum 36. Hujus dimidium 18; erit itaque quadrans in duodeviginti partes tribuendus nempe 5.10.15.20.25.30.35.40.45. & reliquas deinceps, quas ideo compendij gratia ita notabo, & pro arbitrio numeros aſſumam quoſcunque

	Gr.					
					142791	
1	—	10	1095	1095	141696	142791
2	—	19	1085	2180	139516	284487
3	—	27	1066	3246	136270	424003
4	—	36	1039	4285	136270	560273
5	—	44	1003	5288	131985	692258
6	30	50	959	6247	126697	818955
7	—	55	909	7156	120450	939005
8	—	60	854	8010	113294	1052699
9	—	65	794	8804	105284	1157983
10	—	70	729	9533	96480	1254463
11	—	75	659	10192	86947	1341410
12	60	79	584	10776	76755	1418165
13	—	83	505	11281	65979	1484144
14	—	87	422	11703	54698	1538842
15	—	92	335	12038	42995	1581837
16	—	95	243	12281	30957	1612794
17	—	98	148	12429	18676	1631470
18	90	100	50	12479	6247	1637717
		1	2	3	4	5

Vides hic ex numeris fortuitis ſelide tamen quinta rationem ſinuum 90 & 30 graduum eſſe quæ 1637717 ad 818955. Hujus duplum 1637910, ut quinque notæ quam proxime ſint ſanæ; atque inde concludes ſaltem ad radium 10000 ut proxime numeros ſanos, ſed ad 1000 accuratiſſime omnia reſpondere.

Sed

Sed ante quam id tentemus operæ fuerit pretium lineas ſingulis numeris debitas reſpondentes definire: numerus primi laterculi in ſelide quinta 142791, eſſet dimidium latus ſex & trigintanguli; & ideo ſecundus laterculus 284487 erit dimidium latus duodevigintanguli. Et quartus 560273. dimidium latus nonanguli ſive ſinus 20 gr. Fiat itaque ut 1637717 ad 560273 ita 100000 ad 34210. Cum verus ſinus ſit 34202, ut in quarta nota nondum integra unitate peccetur.

Si iterum hanc viciſſitudinem continues, dabuntur ſinus 90 & 30 gr. 21518.3370 & 10759.2888, hic quinque numeri ſunt omnino ſani, & numerus primi laterculi erit 18754934. ſecundi 37367077. quarti 73598386.

Si rurſum, ſinus 90 & 30 gr. erunt 28274206655, & 14137132973, & reciſis noviſſimis quatuor nimium alienis notis dabuntur ſinus 1, 2, 4 iſti 246426, 490977, 967137, quorum veritas conſtabit ſecundum hujus radij notas; ergo facile ad hunc radium 100000 erunt omnes numeri legittimi. Atque ita continuando quantumlibet progredi licebit.

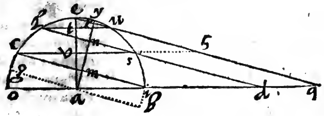
Unum exemplum inſuper adjiciam tantum in typo, tu calculum ſubducito: ſit quærendum latus ſeptanguli; is igitur numerus cum neque à 3 neque à 2 ſit dividuus, aſſumatur ejus ſextuplum nempe 42, cujus dimidium 21, ſunt latera ſemicirculo inſcripta, & in totidem partes quadrans ſecandus unde ſinus expediantur, numerus ſeptimus incurret in $\overline{30}$, & 14^mus in $\overline{60}$.

Et primus erit dimidium lateris duo & quadragintanguli, tertius quatuordecanguli, ſextus quæſiti ſeptanguli: Nam ſumpſiſti ſextuplum ſeptenarij: Ipſe opus expedito ſi libeat, mihi indicaviſſe ſatis eſt.

Ego dum aliud ago & condendis canonibus tangentium atque ſecantium aliquod compendium quæro præter ea quæ ſupra ſuis theorematis & locis ſunt expoſita, dumque ex alio aliud ſcrutor, quia ſatis adhuc in rebus ipſis pervidendis ineſſe difficultatis exiſtimabam, etiam hanc inſtiti viam, quam in hac appendicula propoſ. 3. propoſui; atque inde expoſito diagrammate adverti *aq* æquari inſcriptis *lu*, *cs* & radio *ai*, atque ideo

VII. PROPOSITIO.

Si quadrans ita ſit ſectus, ut prima peripheria cremento, ultima quadranti ſit æqualis, duplum ſinuum quadrante minorum radio auctum, erit tangens peripheriæ quæ dimidio cremento à quadrante deficiat.



IN poſito diagrammate *eu es ei* ſunto peripheriæ propoſitæ, ergo duplum *ut*, *vs*, ad radium *ai* additum dabit *aq* tangentem anguli *aeq*; vel ei æqualem *yaq*, qui inſiſtit in peripheriam *iy*, & deficit à quadrante *ie* dimidio cremento *ey*. In numeris ita ſit

eu 30.

	finus
eu 30.	5000000
vs 60.	8660254
	13660254
	2
	27320508
ai	10000000

37320508 *aq* tangens 75 gr. nam dimidium crementum 15 de 90 deductum tantum facit reliqui. Ita additis ſinibus 10 gr. ab initio increſcendo datur ſumma 52150260, cujus duplum radio auctum dabit 114300520 tangentem 85 grad. Atque ita porro.

VIII. PROPOSTIO.

Si quadrans ita ſit ſectus, ut prima peripheria dimidio cremento, ultima autem quadranti minus dimidio cremento ſit æqualis, omnium ſinuum duplum erit ſecans ultimæ peripheriæ.

IN eodem enim diagrammate recta *eq* eſt ſecans anguli *aeq*, cui æqualis eſt *yaq*. atqui *eq* componitur ex *eu ls ci*, & hi ſunt dupli ſinuum qui pertinent ad peripherias *yu ys yi*. In numeris ita erit

yu. 15.	2588190
ys. 45.	7071068
yi. 75.	9659258
	19318516
	2

38637032 *eq*. ſecans 75 gr. Eodem modo additis ſinibus 5, 15, 25, 35, & cæteris eo ordine, dabitur ſumma 57368564 cujus duplum 114737128 erit ſinus 85 gr.

Hinc

Hinc addita ſecante hac & tangente ejuſdem ex propoſitione antecedente 114300520, dabitur per propoſ. 23. lib. 1. tangens 85 gr. plus dimidio complemento, nempe 87 gr. 30 ſcr. 229037648. differentia autem ejuſdem ſecantis & tangentis erit tangens dimidij complementi 2 grad. 30 ſcr. 4366o8. Idem è fictitijs noſtris ſinibus præſtari poſſet, atque ita etiam tangentes & ſecantes aliquot hac via inde exſculpi potuere.

Vides itaque hoc opere aliquot ſecantes & tangentes, ex ſinibus ſolo additionis & ſubductionis opere derivari poſſe; neque adeo in hiſce majoribus terminis opus eſſe, quam qui ſint idonei ad ſinuum legittimam ſtructuram; hac via etiam Invenies tangentem & ſecantem 89 gr. 58 ſcr. & denique ex utriuſque ſumma tangentē 89 gr. 59 ſcr. ex differentia autem tangentem 1 ſcrupuli: In opere plura occurrent commoda quæ uſui ſint; Et quamvis non omnes ſecantes aut tangentes inveniri hoc modo poſſunt, at illi poſſunt tamen qui quadrantem totum hoc eſt 5400 ſcrupula exactè partiuntur, & ex differentia etiam novi. Dum ego hanc commoditatem in tangentium & ſecantium factione logiſtarum abacis conor inducere, ecce ἡ τύχη τῆς τέχνης ἡμῖν καλλίω βουλεύεται; ita verum eſt hoc vetus verbum, & in illam quam ſupra expoſui ſinuum fabricam expeditiſſimam & parabiliſſimam imprudens incurri. Habeo alia in ſecantium & tangentium tabulis conſtruendis compendia, verum illa adhuc maturitatem quandam ſuam expectant & accuratiorem manum deſiderant.

IX. Pro-

IX. PROPOSITIO.

Denique

Tangens complementi dimidij ſcrupuli, eſt dupla ſummæ ſinuum per ſingula ſcrupula totius quadrantis.

SIT enim *ey* peripheria unius ſcrupuli, & *eu* duorum, angulus itaque *aeu* erit 89 gr. 59 ſcr. & *ut* ſinus duorum ſcrupulorum, *sv* quatuor, atque ita porro ad ultimum ſeu 90 gr. omnes igitur ſinus binorum ſcrupulorum, additi & duplicati, addito denique ipſo radio æquatur *aq* tangenti 89 gr. 59 ſcr. Et rurſum duplum ſinuum 1 ſcr. 3 ſcr. 5 ſcr. ut *ru*, *sn*, *im*, æquatur ſecanti *eq* ejuſdem anguli 89 gr. 59 ſcr. ſunt itaque in his lineis ſcrupula paria & imparia totius quadrantis, tangens itaque & ſecans complementi unius ſcrupuli æquatur ſummæ omnium ſinuum è ſingulis ſcrupulis. Atqui tangens & ſecans peripheriæ æquatur tangenti datæ dimidio complemento auctæ, hoc eſt tangenti 89 gr. 59 ſcr. 30 ſec. Quare tangens complementi dimidij ſcrupuli eſt dupla ſummæ omnium ſinuum.

Atque hæc quidem de ipſa canonis hypoſtaſi τῆς συνθέσεως abunde dicta ſufficiant; ſequitur uſus.

FINIS.

DOCTRI-

DOCTRINÆ TRIANGVLORVM CANONICÆ,

Liber Secvndvs.

De Triangvlis *planis.*

VSvs Canonis in omnium angulorum vel linearum dimenſione verſatur, quæ latera eſſe poſſint trianguli plani vel ſphærici. Nam omne polygonum in ſua triangula reſolvi è geometricis notum eſt; in his autem Canonibus rectæ ad ſuas peripherias & peripheriæ ad ſuas rectas referuntur: Uſus igitur ſimpliciſſimus & primus in ipſis triangulis verſatur; & inde ei quoque nomen, ut *Doctrina Triangulorum* dicatur. Sed cum triangula in varijs gibbis ſuperficiebus varia eſſe poſſint & difformia, noſtri abaci iſta tantum conſectantur, quæ vel rectis lineis, vel maximorum circulorum peripherijs in ſuperficie ſphærica continentur. Et planum quidem rectilineum triangulum nomine generis ab angulis *triangulum* dicemus, ſphæricum autem à lateribus *Tripleuron*, ita enim id Hipparchus & Menelaus etiam jam ante Ptolomæi ætatem vocitabant. De planis igitur triangulis primum, cujus definitio ex Elementis primis petatur. Obiter tamen de angulorum amplitudine id nobis nominatim hic adſcribendum.

I. Pro-

I. PROPOSITIO.

Anguli rectilinei amplitudinem menſurat peripheria, è vertice anguli tanquam centro, intervallo quocunque deſcripta.

ANGVLVM in ſuperficie à duabus rectis lineis comprehenſum ſuperficiem eſſe res ipſa & λογικωτάτη illius P. Rami definitio docent. Nam illud in geometria axioma indubitatum eſt, Magnitudinem ſecari ab eo, quod una dimenſione à ſecta deficiat; Ita corpus à ſuperficie: ſuperficiem à linea: lineam à puncto ſecari omnis Mathematicorum & Philoſophorum ſchola perſonat. Angulus autem in ſuperficie biſecatur, triſecatur, & pro libitu deinceps dividitur à linea, angulus igitur rectilineus ſuperficies eſt: atque ideo cum anguli comparandi erunt, ſecundum ſuperficies erunt comparandi; At ſi in eiuſdem circuli centro plures anguli verticibus componantur, erit ut angulus ad angulum, ita ſector ad ſectorem; ſed ut ſector ad ſectorem ita peripheria ad peripheriam; ex æquo igitur ut angulus ad angulum ita peripheria ad peripheriam. Ergò καταχρηστικῶς eſt cum dicimus peripherias angulos menſurare: nam linea nullam ſuperficiem menſurat. Hoc igitur volunt, quemadmodum 90 graduum peripheria rectum ſubtendit, ita reliquorum angulorum ratio erit talis, quam habent 90 grad. ad peripheriam inter eorum crura interceptam: ut ſi ea ſit 10 graduum, hic angulus ſit recti pars nona; ſi 30 tertia; ſi 45 dimidia: atque ita porrò, ſecundum eandem analogiam.

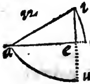
Itaque

Itaque

Peripheriarum, & angulorum in centro, iiſdem inſiſtentium, ſinus tangentes, & ſecantes ſunt iidem.

II. PROPOSITIO.

Si trianguli rectanguli, baſis recti, fiat radius circuli, crura erunt ſinus angulorum oppoſitorum.



VT hic vides, ſi centro *a* intervallo hypotenuſæ *ai* deſcribatur peripheria *io*, tum *ei* erit ſinus anguli acuti *iao*. ſi ex acuto *i* deſcribatur peripheria *au*, tum *ae* fiet ſinus anguli *aie*. res ex ſinuum definitione eſt manifeſta.

III. PROPOSITIO.

Itaque

In triangulo rectangulo data recti baſe, & angulo adjacente, datur crus oppoſitum, & contra: data baſe & crure datur angulus huic oppoſitus.

SIT enim datum triangulum in præcedenti diagrammate *aei*. & baſis recti *ai* 17, crus *ie* 8, & reliquum ideo *ae* 15. cum igitur *ai* erit radius, fiet *ei* ſinus peripheriæ *io*, ſive anguli *iao*. Ideoque cum *ai* radius ſit 17, tum *ei* 8 ob ſimilitudinem ſit ſinus anguli ad *a*. ſi igitur *ai* ſtatuatur partium 100000, tum *ei* eſſet 47059 ſinus nempe 28 gr. 4 ſcr. 21 ſec. Eodem modo concludes quantitatem anguli *aie*: nam ut 17 ad 15, ita 100000 ad ſinum 88235. cui in tabulis cedunt 61 gr. 55 ſcr. 39 ſec. Et uterque

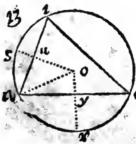
hic

hic angulus compoſitus neceſſario rectum, ſive 90 gr. conflabit: ſecus enim error ſubeſſet.

Et contra. Data baſi *ai* 17 & angulo *iae* 61 gr. 55 ſcr. 39 ſec. dabitur crus recti huic oppoſitum: cogito enim in tabulis triangulum huic æquiangulum; baſis autem ſive ſinus totus illic datur 100000, & ſinus dati anguli 88235. Itaque ut 100000 ad 88235, ita *ai* 17 ad *ie* 15. Eadem via dabitur quoque *ae*, partium 8. poſſent verò & hinc quoque alia derivari; ſed id ſectamur ut radius ſive ſinus totus ſemper ſit primo loco: iſta verò inſuper habebimus, cum his cognitis illa per ſe ſint manifeſta. Et niſi ille nobis ſcopus eſſet propoſitus jam ſola ſinuum tabula omni operi abſolvendo foret idonea, quemadmodum olim veteribus canon inſcriptarum. Verum Tangentium & Secantium tabulæ illi fini ſint introductæ ut operi commodam facilitatem præſtarent, & diviſionis labor eo pacto declinaretur: nobis ſane iſtas minutias perſequi non eſt animus.

IV. PROPOSITIO.

Trianguli latera ſinibus oppoſitorum angulorum ſunt proportionalia.



ID vel ex ipſa ſinuum adſcriptione manifeſtum eſt: Sit enim triangulum *aei* circulo inſcriptum, & centro *o* ſunto perpendiculares *os or* quæ & peripherias & inſcriptas biſecent, & connectatur *ao*. angulus igitur *soa* in centro,

tro, angulo in peripheria *iea* in duplam baſin inſiſtenti erit æqualis: & *aor* angulo *aie*: ſunt igitur dimidia latera tanquam ſinus, & tota ſunt ſuis dimidiis proportionalia; quare ut latus *ae*, ad latus *ai*; ita *ay*, ſinus anguli *aoy* ſeu *aie*, ad *au* ſinum anguli *aos*, ſeu *aei*, quod erat demonſtrandum. Haud admodum diſpar erit demonſtratio in triangulo rectangulo & obtuſangulo.

V. PROPOSITIO.

Itaque

Datis angulis datur ratio laterum.

SINT anguli dati *a* 75 gr. 15 ſcr. *e* 49 gr. 30 ſcr. *i* 55 gr. 15 ſcr. latera hanc accipient rationem, *ei* 9670459. *ai* 7604060. *ae* 8216469. nempe candem quam ſinus angulorum oppoſitorum.

VI. PROPOSITIO.

Et

Dato latere & angulis duobus, dabuntur latera reliqua.

SIT enim in eodem diagrammate latus *ae*, 4103 decempedarum, & angulus *e* 50 gr. 24 ſcr. & *a* 97 gr. 11 ſcr. & quærantur latera *ai ei*. Cum tres anguli trianguli duos rectos æquent: ex duobus *a* & *e* datis, tertius quoque ad *i* dabitur 32 gr. 25 ſcr. Quare per propoſitionem antecedentē erit, quemadmodum ſinus anguli *i* 32 gr. 25 ſcr. 5360724 ad latus oppoſitum *ae* 4103 decempedarum: ita ſinus anguli *e* 50 gr. 24 ſcr. 7705132 ad latus oppoſitum

ai 5898

ai 5898 decempedarum; & ita ſinus anguli *a* 97 gr. 11 ſcr. 9921511 ad latus oppoſitum *ei* 7594 decempedarum. Cum igitur *ae* inter Leidam & Hagam diſtantia ſit 4103 duodecempedarum Rhijnlandicarum; diſtantia Leidæ & Goudæ habebit duodecempedas 5898. Hagæ & Goudæ 7594.

Poſſet idem alijs atque alijs abſolvi modis; ſed hic eſt ſimpliciſſimus, & parabiliſſimus. Omnia hic perſequi non eſt noſtri inſtituti, & circuitiones omnino declinamus.

VII. PROPOSITIO.

Et

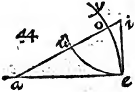
Datis lateribus duobus & angulo non ab ipſis comprehenſo, dabuntur etiam anguli reliqui.

SED hac lege atque conditione, ut reliqui anguli ad baſin ſpecies definiatur, idque vel ex datis implicite, ut cum angulus datus erit rectus aut obtuſus; tum enim reliquos acutos eſſe manifeſtum eſt. vel alioquin generaliter cum dabitur angulus majori lateri oppoſitus, tum enim reliquum minori lateri dato oppoſitum, illo minorem eſſe ex elementis conſtat. Sit igitur in eodem diagrammate *ai* 5898 decempedarum, *ei* 7594 & angulus *iae* 97 gr. 11 ſcr. & quæratur angulus *e*. Erit itaque per propoſ. 4, ut latus *ei* 7594, ad ſinum anguli *a* 9921511; ita latus ſecundum *ai* 5898, ad 7705132 ſinum anguli *e*. & cum is ſinus reſpondeat acuto 50 gr. 24 ſcr. & pariter obtuſo 129 gr. 36 ſcr. latus autem *ie* majus ſit latere *ai*, angulus quoque *e* minor erit angulo *a*, atque ideo angulus *aei* erit 50 gr. 24 ſcr. & ex his duobus datur reliquus ad *i* 32 gr. 25 ſcr.

Quod ſi quartus proportionalis radio ſit æqualis manifeſtum eſt angulum iſtum eſſe rectum.

VIII. Propositio.

Si in triangulo rectangulo, ex acuti vertice tanquam centro, intervallo cruris recti peripheria deſcribatur, reliquum crus erit tangens; & baſis eiuſdem anguli ſecans.



Et hoc quoque ex primi libri theorematis eſt perſpicuum. Sit *aei* triangulum rectangulum; ergo ſi ex angulo *a* intervallo *ae*, circulus *ey* deſcribatur, fiet *ei* tangens peripheriæ *eo* per prop. 12. l. 1. & *ai* ſecans per prop. 17. Haud aliter, ſi centro *i* intervallo *ie*, peripheria *eu* deſcribatur, tum *ae* fiet tangens, & *ia* ſecans.

IX. Propositio.

Itaque

In triangulo rectangulo datis cruribus, dabuntur anguli obliqui: Et datis angulis obliquis dabitur ratio laterum.

Nam in eodem triangulo ſi *ae* ſit radius ex centro *e*, *ei* erit tangens anguli *a* & *ai* ejuſdem ſecans: aut ſi *ei* ſit radius, *ae* erit tangens anguli *i*, & *ae* ejuſdem ſecans. Sit itaque *ae* partium 15, *ei* autem 8; erit ut *ei* 18 ad *ae* 15 ita 10000000 ad tangentem anguli *i* 18750000 61 gr. 55 ſcr. 39 ſec. vel

ut *ae*

ut *ae* 15 ad *ei* 8, ita 10000000 ad tangentem anguli *a* 5333333 28 gr. 4 ſcr. 21 ſec.

Et viciſſim ſi ſtatuatur angulus *i* 61 gr. 55 ſcr. 39 ſec. & *a* 28 gr. 4 ſcr. 21 ſec. dabitur ratio laterum:

Nam ſi *ae* latus datum fiat radius 10000000, *ei* erit tangens anguli *a* 5333333, & baſis recti *ai* ſecans ejuſdem 11333333. atque ita data laterum ratione, & latere *ae* in expoſita menſura pedum 15, reliqua quoque per proportionem concludentur, hoc modo

ut *ae* rad.	ad tang. *a*	ita *ae*	ad *ei*
10000000	5333333	15	8
ut *ae* rad.	ad ſec. *a*	ita *ae*	ad *ai*
10000000	11333333.	15	17.

NOTA.

Potuit idem ex ſinuum tabulis confici: nam ſi *ai* fiat radius, *ae* & *ei* erunt ſinus oppoſitorum angulorum per propoſ. 2. videlicet ſi *ai* ſit 10000000, tum *ei* foret earundem partium 47058823. & *ae* 8823529. atque hinc proportio

ut *ae* ſin. *i*	ad *ei* ſin. *a*	ita *ae*	ad *ei*
8823529	47058823	15	8
ut *ae* ſin. *i*	ad rad. *ai*	ita *ae*	ad *ai*
8823529	10000000	15	17

verum ut vides hic diviſio eſt adhibenda; quod opus ut declinarent, tabulæ tangentium & ſecantium à recentioribus in hanc artem ſunt introductæ. Ideoque hæc via Ptolomæo & veteribus trita, hodie tanquam nimis operoſa negligitur; & profectò quis frugibus inventis glandibus veſci malit?

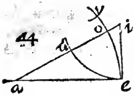
X. PROPOSITIO.

Dato Crure recti & angulo acuto dabitur crus reliquum, & baſis.

DETUR crus recti anguli *ae* pedum 15, & angulus alteruter acutus ut puta *i* 61 gr. 55. ſcr. 39 ſec. hinc jam reliquum acutum ad *a*, qui ejus complementum ſit quoque dari manifeſtum eſt, nempe 28 gr. 4 ſcr. 21 ſec. ideoque dato *ae*, dabitur *ei* per tangentem anguli *a*, *ai* vero per ejuſdem anguli ſecantem.

XI. PROPOSITIO.

Data baſe & crure recti dabuntur anguli.



ID quidem antea per ſinuum tabulas abſolvimus; at idem nunc etiam per ſecantium canones præſtabimus. Nam in eodem diagrammate ſi *ae* ſit radius, *ai* eſt ſecans & *ei* tangens. ſit itaque *ae* 15 *ai* 17. quare

ut *ae*	ad *ai*	ita rad.	ad ſecantem *a*
15	17	10000000	11333333

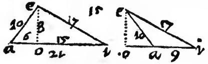
cui cedunt 28 grad. 4 ſcr. 21 ſec. reliquus itaque ad *i* ejus complementum erit 61 gr. 55 ſcr. 39 ſec.

LEMMA, ad id quod ſequitur.

Si ſemiſsis differentiæ inter quadrata crurum & quadratum baſis, per crus alterum dividatur, quotus erit

erit in dividente dicti anguli diſtantia à verticis ſui perpendiculari.

COnſectarium eſt ex elementis, ubi de potentia baſis acuti & obtuſi anguli agitur, derivatum. Itaque demonſtrationem inde petendam cenſeo, nos uſum ſequemur; ſint itaque trianguli *aei* latera *ae* 10, *ai* 21, *ei* 17. & quæratur quantum perpendicularis *eo*, diſtet ab angulo *a*. quadrata crurum anguli, nempe ex *ae* & *ai* addita, conſlant 541. quadratum baſis ejus *ei* 289, differentia 252, hujus dimidium 126 per crus *ai* 21 diviſum, dabit 6 pro *ao* ſegmento: cumque quadrata crurum ſimul excedant quadratum baſis *ei*, angulus igitur *a* acutus erit, & perpendiculum ab *a* verſus *i* diſtabit. Eodem modo invenietur *oi* partium 15.



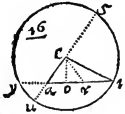
Sit iterum triangulum *aei*. *ea* 10, *ai* 9, *ei* 17. & quæratur quantum perpendicularis *eo* diſtet ab angulo *a*. quadrata crurum anguli *a*, nempe *ea ai* ſimul addita conſlant 181, quadratum baſis *ei* 289, hoc cum ſit majus illorum ſummâ, arguit angulum oppoſitum eſſe obtuſum, atque ideo perpendicularem cadere ab *a* ultra in partem oppoſitam ab *i*. differentia autem quadratorum eſt 108, hujus dimidium 54 per crus *ai* 9 diviſum, dabit *ao* partium ſex, eodem modo invenies *io* 15, atqui jam perpendicularis *eo* haud difficulter invenietur.

IDEM ALITER.

Si factus à ſumma & differentia crurum, per baſin dividatur, quoti & diviſoris ſummæ dimidium, eſt

in baſi diſtantia perpendicularis à crure maiori: differentiæ eorundem dimidium, diſtantia à minori.

ET hoc ab elementis petitum ex duarum inſcriptarum mutua ſectione; ut hic triangulum eſto datum *aei:* ex angulo *a*, radio cruris majoris *ei* deſcribatur circulus *iys*, & continuentur baſis *ia*, & crus minus *ae*. rectangulum *uas*, æquatur rectangulo *iay*, quare *ay* addita ad *ai* dabit totam *iy*, cujus dimidium *io*, diſtantia à crure



majori. rurſum *ya ri* æquentur, reliquæ *ar* dimidium *ao* diſtantia erit à crure minori. Porro ſi ſummæ dimidium ſit majus baſi ut *io* in triangulo *eri*, argumento eſt angulum ad baſin minori cruri adjacentem, nempe *eri* obtuſum eſſe; ſi minor ſit baſi acutum. Poſſet idem lemma alijs atque alijs modis variari, ſed nobis non eſt animus omnia perſequi.

XII. PROPOSITIO.

Datis trianguli lateribus, dantur anguli.

VTRVM rectangulum, obtuſangulum, an acutangulum ſit id ex eorum legibus conſtat; de rectangulo ſupra dictum eſt, obliquangula autem per lemma antecedens in duo rectangula demiſſa perpendiculari dividantur. ut in præmiſſo diagrammate *aei* ſit *ae* 10, *ei* 17, *ai* 21, ſegmenta baſis *ao* 6, *oi* 15; hinc jam ſi *ae* ex *e* tanquam centro fiat radius, erit *ao* ſinus anguli *aeo*, & ideo ipſe angulus 36 gr.

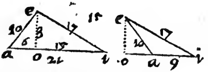
36 gr. 52 ſcr. 12 ſec. & reliquus igitur acutus *eao* 53 gr. 7 ſcr. 48 ſec. qui tamen per ſe ex ſecantibus inveniri poſſit per propoſ. 11. ſi nempe crus *ao* fiat radius, *ae* erit ſecans anguli *eao*;

ut *ao*	ad *ae*	ita radius	ad ſecant.ang. *a*
6	10	10000000	16000000

cui cedunt ut prius 53 gr. 7 ſcr. 48 ſec. potuit idem angulus per ſinus inveniri, ſi ante inveneris quantitatem perpendicularis *ao*. Eodem modo in altero triangulo rectangulo *oei*, dabuntur anguli *oei* 61 gr. 55 ſcr. 39 ſec. & *eio* 28 gr. 4 ſcr. 21 ſec. Et quia perpendicularis *oe* cadit intra triangulum, dabitur totus angulus *aei* 98 gr. 47 ſcr. 51 ſec.

II. Idem Aliter abſque perpendiculari.

Vt duplum facti à cruribus anguli quæſiti, ad differentiam inter quadrata crurum & quadratum baſis: Ita ſinus totus, ad ſinum complementi eiuſdem.



PROPOSVIT Vieta, nos ita demonſtramus. Sit in utroque hoc diagrammate angulus quæſitus *a*, latera data ut ante. Itaque differentia inter quadrata crurum *ae ai*, & quadratum baſis *ei*, erit duplum rectangulum *iao*, per. 12 & 13 prop. ſec. Euclidis. Sed ut *ae* ad *ao*, ſic aſſumpta communi altitudine *ai*, rectangulum *eai* ad rectangulum *iao*, & ita quoque duplum *eai* ad duplum *eao*; ſed ut *ea* ad *ao*, ita ſinus totus ad ſinum anguli *aeo*, qui complementum eſt anguli quæſiti *eao*; & ex æquo igitur ut duplum rectangulum

eai ad duplum *eao*, ita ſinus totus, ad ſinum complementi anguli *eai*, quod demonſtraſſe oportuit.

In eodem igitur triangulo priori, aſſumptis lateribus ijſdem 21, 10, 17. quærantur hoc modo ſinguli anguli ſigillatim. Et primo quidem angulus *a*, cujus crura ſunt *ea ai*. erit itaque

ut	ad	ita ſinus totus	ad ſin. compl. ang. *a*
420	252	10000000	6000000

cui cedit arcus 36 gr. 52 ſcr. 12 ſec, eius itaque complementum erit 53 gr. 7 ſcr. 48 ſec. pro angulo *a*: nam is ex legibus poſitis eſt acutus. Secundo quæratur in eodem diagrammate *aei*, angulus *e*; duplum facti à cruribus *ae ei* erit 340, differentia inter crurum quadrata *ae ei* 389, & quadratum baſis *ai* 441, nempe 52 (& quia baſis quadratum, quadrata crurum excedit, angulus ad *e* erit obtuſus, ſecundum ea quæ ſuperiori lemmate expoſuimus.) Fiat itaque ut 340 ad 52 ita 10000000 ad ſinum complementi quæſiti anguli *e*, 1529410; peripheria huic debita eſt 8 gr. 47 ſcr. 51 ſec. complementum anguli *e*: & cum is ob ea quæ ſuprà retulimus ſit obtuſus, erit igitur 98 gr. 47 ſcr, 51 ſec. quantum eum jam antè invenimus. Sed ut iſta quoque determinatio in promptu ſit, eam hic adnotare utile viſum eſt.

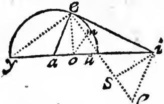
Namque *ſi quadrata crurum cedant quadrato baſis, angulus ab ijs comprehenſus eſt obtuſus; ſi excedant, acutus; ſi æquentur rectus*: quæ ex elementis ſuam veritatem facillime comprobabunt.

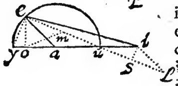
Lemma.

Baſis trianguli plus poteſt quàm crurum differentia, duplici rectangulo ex altero crure atque huius apotomes

tomes & reliqui cruris ſumma, ſi angulus ſit obtuſus; aut differentia, ſi ſecus.

APOTOMEN voco eam partem, quam Regiomontanus caſum perpendicularis dicit. Sit





igitur triangulum *aei*, & anguli *a* baſis *ei*. perpendicularis à vertice *eo*, apotome *ao*, & *ay*, *au* ſint cruri *ae* æquales, connexis *ye eu* angulus *yeu* in ſemicirculo rectus erit: hinc ſit *il* parallela contra *ae*, & triangulum ideo *liu* æquicrurum, cujus baſis *lu* à perpendiculari *is* biſecetur in *s*. hinc ab angulo recto *o* recta *om* biſecet inſcriptam *eu*, quæ ideo ipſi biſegmento *mu* æqualis erit, & triangula *eua oum* ſimilia. his ita conſtitutis, erit ut *le* ad *ai*, ſic *eu* ad *au*, & ſic quoque *ou* ad *um*, quare erit ut *le* ad *ai*, ſic *ou* ad *um*. rectangulaque ideo *le* in *um*, & *ia* in *ou* erunt æqualia, & dupla duplis, nempe *le* in *eu* ipſi *ia* in *ou* bis; ſed *ia* eſt crus unum, *ou* eſt in obtuſo *a* compoſita ex crure reliquo *ae* vel *au*. & apotome prioris *ao*: in acuto ad *a* ex differentia *au ao*. denique *leu* rectangulum æquatur differentiæ quadratorum baſis *ei* & ſegmenti *ui*: nam differentia potentiarum *ei* & *iu* æquatur differentiæ quadratorum ab *es* & *su* ob communē perpendicularem *is*. atqui horum differentia eſt oblongum *leu*; cum enim *lu* ſit biſecta in *s*, & continuata in *e*; oblongum è continuata *le* & continuatione *ue*, cum quadrato biſegmenti *us* vel *ls* æquatur quadrato *es*. quamobrem, ſi dē quadrato *es* ſubducatur̄

quadra-

quadratum *us*, reliquum erit oblongum *leu*, hoc eſt ut oſtendimus *ai* in *ou* bis.

Itaque, Si quadratum differentiæ crurum ſubducatur de quadrato baſis, & reliquum ſit majus duplo crurum rectangulo, angulus ab ijs comprehenſus erit obtuſus; ſi minus, acutus; ſi æquale, rectus: & horum differentiæ dimidio per crus alterum diviſo, quotus erit ejus apotome quæſita.

Ut ſi *ea* ſit 12, *ai* 17, & baſis *ei* 25

17	17	
12	12	25
34	5	25
17	5	625
204	25	25
2		600
408		

quia hic reliquus excedit duplum crurum rectangulum 408, ideo angulus ad *a* erit obtuſus & differentię 192 dimidium 96 per crus 12 diviſum dabit 8 apotomen *ao*. Sed hinc angulus datis lateribus compendioſe invenietur

III. Aliter.

Datis lateribus angulum invenire;

Ut duplum rectangulum crurum, ad exceſſum quadrati baſis ſupra quadratum differentiæ crurum, ita ſinus totus ad ſinum verſum anguli ab illis comprehenſi.

IN præmiſſis diagrammatis angulus ad *a* ſit quæſitus, ſinus verſus *uae* eſt *ou*. ſinus totus *ae* vel *au*. Erit igitur aſſumpta communi altitudine bis *ai*; *ai*

in *au*

in *au* bis ad *ai* in *ou* bis, ut *au* ad *ou*. Sed *ai* in *au* bis eſt duplum rectangulum ſub cruribus *ai* & *ae*; *ai* in *ou* bis eſt æqualis exceſſui quo quadratum baſis *ei* quadratum differentiæ crurum *ui* exſuperat; Id enim præmiſſo lemmate oſtendimus.

Sit ut ante *ae* 12, *ai* 17, *ei* 25, & quæratur angulus *a*.

Fiat ut 408 ad 600, ita 10000000 ad 14705882 ſinum verſum anguli *a*, & quia is major eſt radio, argumentum angulum qui quæritur eſſe obtuſum, nempe

	90		
&	28	4′	21″
	118	4′	21″

Si quis ſinibus delectatur verſis, poterit hanc viam inſiſtere.

IV. Et rurſum Idem Aliter.

Si de dimidio collectorum laterum dati trianguli, latera ſigillatim ſubducantur, erit ut latus facti à dimidio in differentiam lateris quærendo angulo oppoſiti, ad factum à reliquorum laterum differentia, Ita ſinus totus, ad tangentem dimidij anguli quæſiti.

Sint latera eadem quæ prius *ae* 10; *ei* 17, *ai* 21. Et quæratur angulus *a*. collecta latera conſtant 48, dimidium 24, latus angulo *a* oppoſitum eſt *ei* 17, differentia 7. factus *a* 7 & 24 168, factus à reliquis differentiis 3 & 14 eſt 42, 168 ad 42 ſunt in ratione 4 ad 1, horum radices 2 & 1. Itaque ut 2 ad 1, ita ſinus totus 10000000 ad 5000000 tangentem dimidij anguli *a*, nempe 26 gr. 33 ſcr. 54 ſec.

ſec. cujus duplum 53 gr. 7 ſcr. 48 ſec. pro angulo quæſito.

Potuit etiam hoc modo poni,

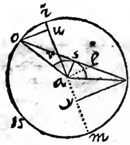
Vt factus	ad factum	ita quad. rad.
168	42	10000000000000000

ad quadratum tangentis dimidij anguli *a*. 25000000000000 cujus latus 5000000 eſt tangens ut ſupra. Et hæc via expedita videtur cum termini erunt minores, illa cum factorum termini erunt majores. Demonſtratio derivatur ex circulo in triangulum inſcripto & areæ triangularis inventione: puto ſufficere ſi tantum id digito indicem, ne nimia varietate & περιεργίᾳ moleſtus ſim.

Porrò autem cum duæ peripheriæ dantur quarum ſinus datam habeant rationem; ſit autem neutra major ſemicirculo, cujuſmodi duo anguli ſunt in triangulo plano; aut duo latera vel anguli in tripleuro ſphærico, Erit

XIII. PROPOSITIO.

Vt ſumma ſinuum, ad differentiam eorundem, ita tangens dimidiæ ſummæ peripheriarum, ad tangentem dimidiæ, earundem differentiæ.



SVnto expoſitarum peripheriarum *oi ie*, ſinus *ou ey*, ſubtenſa utrique pariter *oe*, ſecta à communi radio *ai* in *r*, & perpendicularis in eam ſit *as*; & rectæ *sr* æqualis *sl*. erit igitur *ras* angulo *sal* æqualis; & *lae* dato *oar*. quare *ral* angulus differentiæ inter *lae* hoc eſt, *oar* & *rae*, biſectus eſt ab *as*. & tangens dimidiæ

ſummæ

ſummæ *es* ſi radius aſſumatur *as*; & dimidiæ differentiæ *sr*. Cum igitur triangula *our éyr* ob ſinus parallelos ſint ſimilia, erit *ou* ad *ye*; ut *or* ad *re*. Ergo etiam componendo & dividendo ut ſumma ſinuum *ou ye* ad differentiam eorundem, ita *or* & *re* id eſt *oe* ad *rl* earundem differentiam, & ita quoque harum dimidia *es* ad *sl*. Erit igitur ut *oe* ad *rl*, hoc eſt ut ſumma ſinuum ad differentiam, ita tangens dimidiæ ſummæ, ad tangentem dimidiæ differentiæ. Si peripheriæ ambæ ſimul majores ſint ſemicirculo ſingulæ autem ſemicirculo minores, res eadem erit: nam ſinus tam ad majorem quam minorem peripheriam pariter refertur.

Itaque

CONSECTARIVM.

Data ratione ſinuum, & vel ſumma vel differentia peripheriarum, dantur ſingulæ.

QVod enim in ipſis ſinibus verum eſt, hoc in eorundem homologis terminis quoque verum erit: ita ſi ratio ſinuum ſit ut 9 ad 5, peripheria autem tota 94 gr. 9 ſcr. Fiat igitur ut 14 ad 5, ita tangens dimidiæ peripheriæ 94 gr. 9 ſcr. hoc eſt 47 gr. 4 ſcr. 30 ſec. 10751870 ad 3071963 tangentem dimidiæ differentiæ 17 gr. 4 ſcr. 30 ſec. quæ peripheria ad ſupraſcriptum dimidium addita & ab eodem deducta, dabit peripheriam majorem 64 gr. 9 ſcr. minorem 30 gr. 0 ſcr.

Quod ſi ſinuum ratione data, differentia peripheriarum eſſet data, ut manente eadem ratione 9 ad 5. ſit differentia 34 gr. 9 ſc. Vt igitur 4 ad 14, ita tangens dimidiæ differentiæ 17 gr. 4 ſcr. 30 ſec. 3071963 ad tangentem ſummæ peripheriarum dimidiæ. 10751870 cui cedunt 47 gr. 4 ſcr. 30 ſec.

pro

pro ſumma dimidia, huc dimidia differentia & addita & dempta, dabit peripherias quæſitas 64 gr. 9 ſcr. & 30 gr. 0 ſcr.

XIV. PROPOSITIO.

Datis duobus trianguli lateribus, & angulo ab ipſis comprehenſo, dantur anguli reliqui.

NAM datis cruribus trianguli, datur ratio ſinuum qui ad angulos oppoſitos pertinent per propoſ. 4. Sit enim in triangulo *aei* propoſ. 12. angulus *a* 53 gr. 7 ſcr. 48 ſec. & crus *ae* 10, *ai* 21, hinc reliqui anguli nobis ſint inquirendi: ſi datus angulus de duobus rectis ſubducatur, datur ſumma angulorum *e* & *i* nempe 126 gr. 52 ſcr. 12 ſec. Hujus ſemiſſis 63 gr. 26 ſcr. 6 ſec. tangens 20000044, ut igitur ſumma crurum 31, ad differentiam eorundem 11, ita tangens 20000044 ad 7016789 tangentem dimidiæ differentiæ 35 gr. 21 ſcr. 45 ſec. hæc peripheria ad ſummæ dimidium addita, dabit angulum *e* majori lateri *ai* ſubtenſum 98 gr. 47 ſcr. 51 ſec. & ab eodem dimidio ſubducta, dabit reliquum angulum *i* minori lateri ſubtenſum 28 gr. 4 ſcr. 21 ſec.

II. IDEM ALITER.

SED idem etiam aliter reductione ad rectangula præſtari poteſt, ſi cui id arrideat: nam ſi ab alterutro reliquorum angulorum, perpendicularis demittatur *eo*, in triangulo rectangulo *eao* dantur *ae* baſis recti cum angulo. itaque per propoſ. 2. dabitur *ao* & *eo*. ex differentia autem *ao* & *ai*, dabitur *oi*. quare in triangulo rectangulo *eoi* datis cruribus

per

per propoſ.9. dabitur angulus *i* quæſitus, atque ita quoque reliquus ad *e*, quem tamen è duobus *aeo ieo* conflare licet ut tanquam examen ſit tui operis.

Hinc jam ex utraque hac factione, baſin anguli dati haud difficulter inveſtigabis: nam ſi priorem modum ſequaris adhibenda eſt propoſitio 5. ſi poſteriorem vel ex quadratis *eo oi* dabitur quadratum *ei*; vel invento angulo *i* per propoſ. 10.

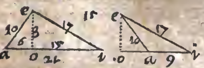
Sed & baſis datis cruribus cum angulo ab ipſis comprehenſo, per ſe abſque ulla circuitione inveniri poterit hoc modo

III. IDEM ALITER.

Vt ſinus totus, ad ſinum complementi dati anguli; ita duplex rectangulum ſub cruribus, ad differentiam inter quadrata crurum & quadratum baſis.

ET ſi quidem angulus datus acutus exiſtat dematur à crurum quadratis, ſin obtuſus ijſdem addatur, & numerus hinc exiſtens erit quadratum baſis,

Hujus theorematis veritas ita poteſt demonſtrari: detur angulus *a* cum cruribus *ca ai*. & ab *e* perpendicularis *eo*.



erit ergo ut ſinus totus ad ſinum anguli *aeo*, ita *ae*, ad *ao*, atque ita, aſſumpta communi altitudine *ai*, rectangulum *ea* in *ai*, ad *ao* in *ai*. atque ita duplum rectangulum *eai* ad duplum *oai*: ſed duplum rectangulum ſub *oa* & *ai* æquatur differentiæ inter quadrata crurum *ae* & *ai* ſimul, & quadratum baſis *ei*. cum autem angulus acutus eſt, crurum qua-

 drata

drata tanto ſunt majora ; at cum obtuſus tanto minora quam quadratum baſis ; hoc enim ex elementis planum eſt. atque ita dabitur baſis quadratum, & inde baſis ipſa.

In numeris exemplum eſto tale. Sit *ae* 10, *ai* 21, angulus *cai* 53 gr. 7 ſcr. 48 ſec. ſinus complementi eſt 5999992. duplum rectangulum ſub cruribus *ae* & *ai* 420.

ut ſin.tot.	ad ſin.com.*a*,	ita dupl.rect.	ad
10000000	5999992	420	252

hæc igitur eſt differentia inter quadrata crurum *ae ai*, & quadratum baſis *ei*. & cum angulus datus *a* ſit acutus, erit à crurum quadratis 541, ſubducenda, reliquus 289 eſt quadratum baſis *ei* & ipſa adeo *ei* 17. quam invenire oportuit.

IV. IDEM ALITER.

Vt ſinus totus ad ſinum verſum anguli dati, ita duplex rectangulum crurum, ad exceſſum quo quadratum baſis ſuperat quadratum differentiæ crurum.

VEritas hujus è lemmate caſus tertij propoſitionis 12 eſt manifeſta, itaque inde repetatur. Sit *ae* 12, *ai* 17, & angulus *eai* $\overline{118}$ 4′ 21″ & quæratur baſis *ei*.

ut ſin. tot.	ad ſin. verſum	ita dupl.rect.crurũ	
10000000	$\overline{118}$.4′.21″.	408	ad 600;
	14705885		

huic itaque ſi addatur quadratum à differentia crurum, nempe 25, totus 625 erit quadratum baſis *ei*, Cujus latus 25, ipſa baſis *ei* quæſita.

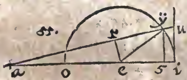
Sed ad extremum etiam hanc mantiſſam accipito;

pito: Quomodo datis trianguli rectanguli lateribus ejuſdem anguli abſque his canonicis Sinuum, Tangentium aut Secantium tabulis inveniri poſſint.

XV. PROPOSITIO.

Vt duplum baſis anguli recti crure maiore auctum ad crus minus, ita ſinus totius triplum, ad peripheriam angulo minori cruri oppoſito congruam.

HVIVS veritatem & demonſtrationem pete è cyclometrico noſtro propoſitione 28 & 31: nos ſolo uſu nunc erimus contenti, ſi plura requiras iſtinc ea tibi erunt arceſſenda. Exemplum tale eſto, Sit in expoſito triangulo rectangulo *esy*, baſis *ey* 25, crus recti majus *es* 24, & *ys* 7, & fiat ut dupla *ey* & *es*, hoc eſt *as* 74 ad *sy* 7, ita triplum ſinus totius tanquam ea eſſet *ai*



300000.000 ad *iu* 28378.378, cui ut in cyclometricis oſtenſum eſt peripheria *yi* ut proxime æquatur, ſed tamen aliquo minimo ipſam *iu* excedit.

Si ita ſcire expetas quot gradibus & minutis ea recta, vel *yi* peripheria reſpondeat, proportione concludes: Cum enim ad iſtam diametri taxationem 200000000, peripheria circuli ſit 628318531. Erit itaque ut 628318531 ad numerum inventum 28378378, ita 360 grad. ad 16 grad. 15 ſcr. 34 ſec. 37 ter.

Poſito radio 100000.000 partium.

Gr.	Peripheria.	Gr.	Peripheria	Gr	Peripheria.
1	1745.329	31	54105.207	61	106465.084
2	3490.658	32	55850.536	62	108210.414
3	5235.988	33	57595.865	63	109955.743
4	6981.317	34	59341.195	64	111701.072
5	8726.646	35	61086.524	65	113446.401
6	10471.976	36	62831.853	66	115191.731
7	12217.305	37	64577.182	67	116937.060
8	13962.634	38	66322.512	68	118682.389
9	15707.963	39	68067.841	69	120427.718
10	17453.293	40	69813.170	70	122173.048
11	19198.622	41	71558.499	71	123918.377
12	20943.951	42	73303.829	72	125663.706
13	22689.280	43	75049.158	73	127409.035
14	24434.610	44	76794.487	74	129154.365
15	26179.939	45	78539.816	75	130899.694
16	27925.268	46	80285.146	76	132645.023
17	29670.597	47	82030.475	77	134390.352
18	31415.927	48	83775.804	78	136135.682
19	33161.256	49	85521.133	79	137881.011
20	34906.585	50	87266.463	80	139626.340
21	36651.914	51	89011.792	81	141371.669
22	38397.244	52	90757.121	82	143116.999
23	40142.573	53	92502.450	83	144862.328
24	41887.902	54	94247.780	84	146607.657
25	43633 231	55	95993.109	85	148352.986
26	45378.561	56	97738.138	86	150098.316
27	47123.890	57	99483.767	87	151843.645
28	48869.219	58	101229 097	88	153588.974
29	50614.548	59	102974.426	89	155334.303
30	52359.877	60	104719.755	90	157079.633

Scr. prima

Scr. pri.	Peripheria.	pri.	Peripheria.	Sec.	Peripher.	Sec	Peripher.
1	29.089	31	901.752	1	485	31	15.029
2	58.178	32	930.842	2	970	32	15.514
3	87.266	33	959.931	3	1.454	33	15.999
4	116.355	34	989.020	4	1.939	34	16.484
5	145.444	35	1018.109	5	2.424	35	16.968
6	174.533	36	1047.198	6	2.909	36	17.453
7	203.622	37	1076.286	7	3.394	37	17.938
8	232.711	38	1105.375	8	3.878	38	18.423
9	261.799	39	1134.464	9	4.363	39	18.908
10	290.888	40	1163.553	10	4.848	40	19.393
11	319 977	41	1192.642	11	5.333	41	19.877
12	349.066	42	1221. 730	12	5. 818	42	20.362
13	378.155	43	1250.819	13	6.303	43	20.847
14	407.243	44	1279.908	14	6.787	44	21.332
15	436.332	45	1308.997	15	7.272	45	21.817
16	465.421	46	1338.086	16	7.757	46	22.301
17	494.510	47	1367.175	17	8.842	47	22.786
18	523.599	48	1396.263	18	8.727	48	23.271
19	552.688	49	1425.352	19	9.211	49	23.756
20	581.776	50	1454.441	20	9.696	50	24.241
21	610.865	51	1483.530	21	10.181	51	24.725
22	639.954	52	1512. 619	22	10.666	52	25.210
23	669.043	53	1541 707	23	11. 151	53	25.695
24	698.133	54	1570.796	24	11. 635	54	26.180
25	727.221	55	1599.885	25	12. 120	55	26.665
26	756.309	56	1628.974	26	12.605	56	27.150
27	785.398	57	1658.063	27	13.090	57	27.634
28	814.487	58	1687.152	28	13.575	58	28.119
29	843.576	59	1716. 240	29	14.060	59	28.640
30	872.665	60	1745.329	30	14.544	60	29.089

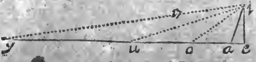
Canonia iſta facile ipſe concenturiabis ubi ubi locorum verſetis, modo rationem diametri ad peripheriam memoriæ infixam ſerves. Namcum diameter erit 1 00000,00000.00000 tum peripheria, erit 3.141[illegible]625.35.89793 atque hinc facile eſt invenire quantum uni gradui, quantum denis aut vicenis cedat; & ſimiliter quantum uni ſcrupulo primo, ſecundo, tertio, & quantum denis, unde ſola additione tabellæ iſtæ conflantur.

Sed quia iſtud perquam moleſtum & operoſum eſt, tabellam conſtruxi in qua ſingulorum totius quadrantis graduũ quantitas ad radium 10000000 ſit ſubducta; & inde ſingulorum ſcrupulorum, atque adeo ſecundorum quoque. Cujus uſus hic eſt, ut ex dato numero ſtatim ipſius quantitas in gradibus ac minutis, & contra inveniri poſſit; Id enim in eodem numero 28378.378, experieris hoc modo

28378.378	
27925.268	16 gr.
453.110	
436.332	15 ſcr.
16.778	
16.484	34 ſec.
294	

unde efficitur angulum quæſitum *yes*, eſſe 16 grad 15 ſcr.34 ſec.37 ter,ut ſupra. quem è tabulis ſinuum invenies 16 gr.15 ſcr. 36 ſec.44 tert. ut ille à nobis hac via inventus 2 ſec.7 ter, iſtoc tantum ſit minor.

Sed non opus erat ad tabulas provocare quin adeo noſtra factio à ſeipſa ſuæ veritatis πίστωσιν & fidejuſſorem accipiet. Verum hoc mihi ante monendus es, ſi baſi anguli recti (ut in hoc diagram-



mate *aci*) nempe *ai*, ſtatuam *oa* æqualem, angulum *ioe* dimidium eſſe ipſius *iae*, quia *iae* externus duobus *aoi aio* inter ſe æqualibus, eſt æqualis. eandem ob cauſam ſi *oi* & *ou* æquentur, angulus *eui* erit dimidius ipſius *eoi*, & quadrans anguli *eai*.

Sit igitur *ae* 7, *ei* 24, *ai* 25, & cum majori errori obnoxium

obnoxium hoc ſit, quando duplum baſis minori cruri adjicitur & inde proportio inſtituitur; inveniantur latera trianguli *oei*. & *ei* quidem erit ſemper eadem; *oe* autem ex *ea* & *ai* compoſita, erit 32 partium, & è quadratis *oe* & *ei*, dabitur *oi* 40. Fiat itaque ut in theoremate eſt expreſſum, quemadmodum *oe* 32 & *oi* bis, hoc eſt 112, ad *ei* 24, ita 300000000 ad 64285714 peripheriam angulo *o* debitam, cui ut vides reſpondent 36. 49′ 59″. qui tamen verè debebat eſſe 36. 52′. 12″ ut error ſit $2'\frac{1}{4}$. ergo in duplo $\overline{73}$. 39′. 58″ deficerent $4'\frac{1}{2}$. Hoc ideo moneo ut videas terminos qui operi tuo & & accuratæ diligentiæ, quam poſtulabis, ſint ſatis. quare iteretur biſectio, & *oi* 40 cum *oe* 32, compoſita conflent nobis *eu* 72. inde quadrata *ie* & *ue* dabunt baſin *ui* $75\frac{894660}{10000000}$. Atque hinc proportio ut *eu* cum dupla *ui* $223\frac{789320}{10000000}$ ad *ei* 24, ita triplum ſinus totius 300000000 ad 32173117 pro peripheria debita angulo *u*, cui ex canonio appoſito cedunt $\overline{18}$. 26′. 1″. 50‴. cum debeant, fuiſſe $\overline{18}$. 26′ 6″. 49‴ ut differentia ſit tantum 5″. Porrò quadruplum inventæ peripheriæ nempe $\overline{73}$ 44′ 7″ 20‴ definiet angulum *iae*. qui additus ad ſupra inventum *aie*, 16. 15′. 34″. 37‴. conflat 89 gr. 59′. 41″. 37‴. ut differentia à recto tantum ſit 18″. Quod ſi utrumq; iterum libuiſſet biſecare, jam error demum in ſcrupula tertia incurreret, quod experiunti manifeſtum erit: Atque ita continuando vel in ipſis quartis, quintis, & ultra, accurata veritas extorqueri poſſet.

Porrò autem, ut tuo uſui hic locus opportune ſerviat, iſti limites erunt tibi notandi.

I. Cum crura anguli recti erunt æqualia, tum

directe hac via tantum 6 ſcrupulis infra verum conſiſtes.

II. Cum ratio majoris cruris ad minus ea erit quæ 4 ad 3, tum tantùm $2'\frac{1}{2}$ ſcrupulis à vero deficiet.

III. Cum ea erit quæ 24 ad 7, tum anguli minoris acuti quantitas à verò deficiet tantum $\frac{1}{2}$ ſecundis.

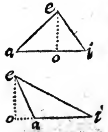
Et hinc adeo tibi facile eſt pervidere, quouſque biſecando velis progredi, & quatenus ulterior operis & calculi tui περιεργία debeat procedere. atque ita hic planorum triangulorum, & Libri ſecundi ſimul FINIS eſto.

PROBLE-

PROBLEMATA GEODAETICA.

I. PROBLEMA.

Datis trianguli lateribus duobus & angulo ab ipſis comprehenſo, perpendicularem ab angulo ignoto in crus oppoſitum invenire.



VT ſi detur angulus *a* 60 gr. & ejus crura *ea* 24 decemp. *ai* 30, & quæratur perpendicularis *eo*. Cum igitur in triangulo *eoa* detur angulus *a* & baſis recti *ae*, erit per propoſ. 2 lib. 2.

ut ſinus totus	ad ſinum ang. *a*	ita *ae*	ad *eo*
10000000	8660254.	24 decemp.	$20\frac{78}{100}$

quem numerum ſecundum decumanam partitionem ita enuntiamus, 20 decemp. 7 pedes, 8 digit. Qui ſcrupuloſe accurati ſunt etiam decimas digitorum & decimarum decimas adjiciunt, quod aliquando in corporum dimenſione eſt neceſſarium.

Si ang. ad *a* detur obtuſus, ſumendus eſt ſinus reſidui ejus, qui æquo jure ad illum ipſum attinet, ut ſi in hoc exemplo detur 120 grad. tum operatio erit plane eadem, quoniam aſſumendus eſt ſinus 60 graduum.

CONSECTARIUM.

Itaque

Vt ſinus totus, ad ſinum anguli dati, ita rectangulum ſub eius cruribus, ad duplum areæ propoſiti trianguli.

CUM enim per antecedens problema ſit ut ſinus totus, ad ſinum anguli *a*, ita crus *ae* ad perpendicularem *eo*; aſſumpta communi altitudine *ai*, erit quoque ita rectangulum *ae* in *ai* ad rectangulum *eo* in *ai* quod eſt ipſius trianguli duplum, ut hic

24 *ae*

Radius ſin. 60 gr. ita 30 *ai* ad *eo* in *ai* 623 $\frac{5382}{10000}$
10000000 8660234 720
ſive 623 decemp. quadrat. 53 pedes quadr. 82 dig.
quadr. dec. ped. dig.
cujus dimidium 311, 76, 91, ipſam aream exprimunt.

II. PROBLEMA.

Datâ trianguli baſe, angulo adjacente, & areâ invenire reliqua latera.



IN triangulo *bad*, detur baſis *bd* 24 decemp. angulus *abd* 42 gr. 30 ſcr. & area ipſius 140 decemp. quærantur vero latera ſingula, *ba*, *ad*; Itaque diviſâ areâ 140 decemp. per dimidiam baſin 12, venit perpendicularis *ac* 11 decemp. 6 ped. 6 dig. & cum detur angulus

angulus *abc* in triang. rectangulo *bca* innoteſcit quoque angulus *bac* 47 gr.30 ſcr. eritque per prop. 9 lib.2.

ut radius	ad ſecant.ang.	ita perpen.	ad latus *ba*;
10000000	*bac*	*ac*	17.2.6.
	14801872	11.6.6,	

ſive decemped. 17. ped.2. dig.6.

Latus *ad* invenietur per 4 conſ. 14 prop.lib.2. ex datis *bd*, *ba* & angulo ad *b*; hoc modo

ut radius,	ad ſinum verſum	ita duplum rect.
10000000	anguli *b*,	crurum,
	2627227	8284800

Ad exceſſum quo quadr. baſis *ad*, excedit quad. diff. crurum 2176605:

huic igitur ſi addatur quadratum differentiæ crurum 674, venit quadr.baſis *ad* 2177279 atque ideo ipſum latus *ad* erit 1494 ſeu 14 dec. 9 ped. 4 dig. Potuiſſet etiam alia ratione inveniri ſegmentum *bc*, nempe ex dati anguli *bac* tangente; eoque à *bd* ablato, reliquum ſegmentum *cd*, & inde per 47 prop. 1 Euclidis, utrumque latus *ba*, *ad*. concludi, ſed hæc via facilior eſt. Et tamen abſque perpendiculari, latus *ba* ſic invenies,

ut ſinus totus	ad ſecantem	ita duplum areæ
10000000	ang. *bac*	trianguli,
	14801872	280

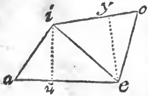
Ad rectangulum ſub cruribus *ba*,*bd*, $414\frac{45}{100}$

Quo diviſo per latus *bd* veniunt ut ante pro latere *ba* 17. 2. 6. Ratio petenda eſt ex conſ. problem. 1: nam aſſumtâ communi altitudine *bd*, rectangula ſub *ba* in *bd*, & *ac* in *bd*, ſunt inter ſe ut baſes *ac* & *ab* hoc eſt ut radius ad ſecantem anguli *bac*; rectangulum autem *ac* in *ab*, eſt duplum areæ trianguli propoſiti ut cuique manifeſtum eſt.

III. PRO-

III. PROBLEMA.

Datis quadranguli lateribus, & angulo uno, aream invenire.



SIt in propoſito diagrammate *ae* 54, *eo* 32, *oi* 46, *ia* 28 decempedarum, angulus *iae* 67 gr. 30 ſcr. ut ex his datis area inveniatur, ea nobis vel ex ſolâ diagonio, vel ex perpendicularibus *iu ey* venit inveſtiganda. Et primum quidem ex diagonio *ie* per propoſ. 14. lib. 2 hoc modo,

ut ſinus totus, ad ſinum comp. ang. *a* 67 gr. 30 ſcr.
10000000 3826834
Ita duplex rectang. ſub cruribus *ai ae*. 30240000
ad 11572346, differentiã ſcilicet inter quadrata crurum & quadr. baſis; cumque hic angulus datus exiſtat acutus, dematur à quadratis crurum 37000000 reliquum igitur 25427654 erit quadratum baſis, cujus latus eſt $50\frac{42}{100}$ ſive 50 decemp. 4 ped. 2 dig. hoc modo 50. 4. 2. pro *ei*. Atque hinc datis lateribus tribus in utroque triangulo reliqua inveniantur: certè trianguli *eoi* area invenietur ex collectorum laterum dimidio & differentijs, per elem. 9 lib. 12 P. Rami, ſic

eo, 32.0.0.
oi, 46.0.0.
ie, 50.4.2.
ſumma 128.4.2.
dimid. 6421

6421 dimid.
3200. 4600. 5042.
reliqui
3221. 1821. 1379

factus

factus continuè à dimidio & reliquis erit 51935886974519. cujus latus 7206655. dig. quadrati, erit area trianguli, nempe 720 decemp. 66 ped. 55 dig. Potuiſti hic neglectis initio digitis aream minoribus numeris invenire, ſed iſti pauculos pedes quadratos in vitium traxiſſent.

Quamobrem in minoribus forſan hic expediet invenire angulum *ioe*, quod hoc caſu peropportunè abſolvetur per modum ſecundum prop. 12 lib. 2. Cum enim detur ſuprà quadratum baſis *ei* 25427654 hujus à crurum *io oe* quadratis 31400060 differentia eſt 5972346; duplum rectangulum ſub cruribus *io oe* eſt 29440000, Erit itaque

ut duplum rect. crur. *oe*, *oi*,	Ad differ. inter, quad. crur. & baſis	ita ſinus totus
29440000	5972346	10000000

Ad ſinum 2031250 cui cedunt 11 gr. 43 ſcr. 11 ſec. & quia baſis quadratum, quadratis crurum minus eſt, angulus *o* erit acutus: quare ipſe datur 78 grad. 16 min. 49 ſec. hinc itaque in triangulo rectangulo *eyo* datâ baſi *eo* 32; & angulo ad *o* 78 gr. 16 min. 49 ſec. dabitur per conſ. prop. 2. lib. 2. perpendicularis *ey*

ut ſinus totus,	ad ſinum ang, *o*,	ita *oe*,	ad *ey*
10000000.	9791527	32.0.0.	$3133\frac{2816}{10000}$

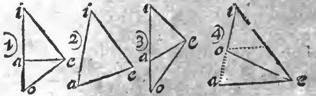
quæ per dimidium lateris *oi*, 23 multiplicata dabit aream triang. *ico* 720 decemp. 65 ped. quæ quantitas ob lubricitatē calculi à ſuperiori paulũ differt.

Porro area reliqui trianguli *iae* eadem via dabitur 698 decemp. 39 ped. 19 dig. aut inventa perpendiculari *iu*, $25\frac{8686}{10000}$ per tabulas ſinuum, eâque in dimidiam baſin *ae* 27 multiplicatâ, erit eadem area, 698 decemp. 45 ped. 20 dig. Quamobrem totius trapezij area erit aut 1419 dec. 5 ped. 74 dig. aut

aut per calculum poſteriorem 1419 dec. 10 ped. 29 dig. quadratorum, accuratiorem conſenſum ſi quis requirat, is calculum ſubducat alijs ſuppoſitis lateribus, nobis viam ſaltem monſtraſſe jam ſufficiet.

IV. PROBLEMA.

Duorum locorum in quorum altero, vel ſaltem uſpiam in rectâ ea connectente ſtatio detur, diſtantiam invenire.



SIT diſtantia menſuranda, *ai*, & in *a* detur mihi ſtatio, unde liberè quocunque angulo poſſim diſcedere. Itaque cruce metatoriâ quam tetrantem vocant, angulum rectum conſtituam *iae*, & aſſumptâ ſtatione ſecundâ in *ea* linea, in puncto *e*, obſervabo quantitatem anguli *aei* ut puta 67 grad. 45 ſcr. & dimenſus latus *ae*, id invenerim decemp. 105, pedum 4, hoc modo, 105.4. Itaque ſi *ae* fiat radius, *ai* erit tangens ang. *iea*, quare

ut rad.	ad tang. 67 gr. 45 ſcr.	ita *ae*	ad *ai*
100000	244433	105.4.	257.6.

erit itaque *ai* 257. decemp. 6 ped.

At ſi non in altero limite, ſed intermedio diſtantiæ menſurandæ loco, ſtatio tibi concedatur, ut ſi diſtantia ſit *oi*, ergo eodem modo ut ante, primum invenies *ai*, & tum *ao*, quæ ſegmenta in unam ſummam conflata, dabunt totam *io*.

Secandò

Secundò ſi angulus non ſit arbitrij tui, ad *a* mediocriter acutum ſi liceat eligito ut hic, eumque obſervato, qui nobis ſit *iae* 77 gr. 9 ſcr. & *aei* 45 gr. 21 ſcr. & *ae* 1092 dec. 3 ped. hinc adeo dati duo anguli *a* & *e*, deducti de 180 gr. ſeu duobus rectis, relinquent tertium, *aie* 57 gr. 30 ſcr. ideoque per propoſ. 4. lib. 2.

ut ſin. ang. *i*, 57 gr. 30 ſcr.	ad latus oppoſ. *ae*
84339	1092.3.
ita ſin. ang. *e*, 45 gr. 21 ſcr.	ad latus oppoſ. *ai*
71141	921.4.

Tertiò, ſi intrà terminos *oi* ſtatio *a* detur, eodem modo obſervato angulo *aeo* 50 gr. 30 ſcr. datoque ang. *eao* reſiduo ſcil. *iae*, 102 gr. 51 ſcr. & proinde etiam *aoe*, 26 gr. 39 ſcr. concludetur longitudo *ao* 1878.9. quæ ambæ in unam ſummam conflatæ, dabunt quæſitam *oi*, 2800.3. at ſi extrà lineam, & tamen in directum terminorum *oi*, ſtatio detur ut hic in fig. quartâ, loco *a*, tum *ao* erit de *ai* ſubducenda, ut relinquatur *oi*; cæterum variari poteſt hoc problema, angulo quocunq; conceſſo, modo detur intervallum ſtationum legittimum, & alia quæ ſine ulla difficultate cuivis in praxi facile obvia ſunt.

V. PROBLEMA.

Angulo in uno menſurandi intervalli termino dato, ſtationis diſtantiam in hoc crure invenire quæ ad propoſitum intervallum rationem habeat datam.



SI latus ſtationis *ae* cum intervallo *ai* comprehendat angulum rectum, tum ſi *ae* fiat radius, *ai* erit tangens atque ideo cum angulus *iea* 45 gr.

45 gr. erit, *ae* & *ai* æquabuntur; unde ſi ipſam *ae* dimenſus fueris, etiam *ai* dabitur: hac via Pyramidum in Ægypto altitudinem, ſed per elevationem ſolis & umbram Thaletem dimenſum, autor eſt Plutarchus in convivio ſeptem ſapientum.

Secundò ex iiſdem tabulis tangentium liquet, aſſumpto angulo *iea* 56 gr. 19 ſcr. *ai* ut proxime eſſe ſeſquialteram ipſius *ae*.

Tertiò cum *iea* aſſumetur 63 gr. 26 ſcr. tum *ai* eſſe duplam *ae*.

Quartò cum *iea* aſſumetur 68 gr. 12 ſcr. tum *ai* eſſe ipſius *ae* duplam ſeſquialteram.

Quintò cum 71 gr. 34 ſcr. tum *ai* eſſe ipſius *ae* triplam; cum 74 gr. 3 ſcr. tum *ai* eſſe ipſius *ae* ut proximè triplam ſeſquialteram. atque ita porrò; numeri quidem has rationes non accurate exprimunt attamen quandoquidem in ſcr. primis ſubſiſtitur ſufficit eos in calculum adhibere, aut etiam ad minores terminos revocare.

At ſi angulus detur acutus vel obtuſus, ut in exemplo ſi *iae* detur gr. 60. tum hoc caſu *aei* itidem erit 60 gr. atque ideo latera *ae*, *ai* erunt æqualia, quia anguli ad baſin *ei* inter ſe æquales ſunt. Verum poſtuletur ut *ai* ſit ipſius *ae* dupla, angulo ad *a* manente grad. 60. hic jam cum per 3 propoſ. lib. 2. latera ſinibus oppoſitorum angulorum ſint proportionalia; dabitur ratio ſinuum qui pertinent ad angulos *e* & *i*, dataque eorundem ſumma, quæ eſt 120 gr. dati ang. *a* 50 gr. reſiduum ad ſemicirculum; per prop. 13 lib. 2. ſinguli dari poſſunt, ut hic quia ratio datur dupla, erit

ut 3 ad 1 ita tang. dimid. 120 ad tang. dimid. diff.
nempe 60 gr. 57735
173205

cui competunt gr. 30, unde angulus major datur 90, minor

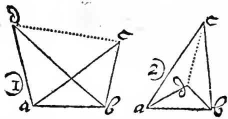
minor 30 gr. Quamobrem cum *eai* erit 60 gr. ſi eouſque procedas ut *aci* ſit 90 gr. *ai* erit dupla inventæ baſeos *ae*, quia poſito *ae* radio, *ai* eſt ſecans anguli *a*.

Si *aei* ſit 79 gr. 6 ſcr. tum *ai* ſinus ang. *e*, erit in ſeſquialtera ratione ad *ae* ſinum anguli *i*, & rurſum manente eodem ang. *a* 60 gr. ſi *aei* ſit 96 gr. 35 ſcr. tum *ai* erit dupla ſeſquialtera ad *ae*.

Cum vero *aei* erit 100 gr. 54 ſcr. tum *ai* erit tripla *ae*, ut proximè. Atque hinc quoad lubebit, ſub quocunque angulo dato hanc rationem licebit explicare, unde gnavus & induſtrius Geodæta, multa ſuo uſui, & compendio derivare poterit.

VI. Problema.

Duorum locorum, in quorum neutro ſtatio conceditur, dato ſolummodo alibi ſtationum duarum intervallo, diſtantiam invenire.



Sint data duo loca in primo diagrammate *cd*, ſtationes duæ alibi extrà lineam quæ illa connectit, in *a* & *b*, diſtantiâ 244 decempedarum, 6 pedum, ſic 244.6. obſervatis angulis *dba* 36 gr. 15 ſcr. *dab*, 124 gr. 20 ſcr. Item *cab* 40 gr. 49 ſcr. & *abc* 112 gr. 30 ſcr. Inveſtigabitur linea *cd* hoc modo: Primo in triangulo *dab* datis duobus angulis, dabitur tertius *adb* 19 gr. 25 ſcr. datoq; latere *ab*, erit per prop. 6 lib. 2.

 ut

ut ſinus ang. *d*, ad latus *ab*, ita ſinus ang. *dba*
3324355 244.6. 5913096
ad latus *da* & ita ſinus ang. *dab*. ad latus *db*
435.4. 8257703 607.5.

Secundò, in triangulo *abc*, datis angulis *cab* 40 gr. 49 ſcr. & *abc* 112 gr. 30 ſcr. dabitur tertius *acb* 26 gr. 41 ſcr. ideoque erit, per eandem prop.

ut ſinus ang. *c* ad latus *ab* ita ſinus ang. *cab*.
4490591 244.6. 6536408
ad latus *bc* & ſinus ang. *abc* ad latus *ac*.
356.0. 9238795 503.2.

His peractis aſſumam unum ex duobus triangulis, *dac* vel *dbc*, in quibus datis duobus lateribus, cum ang. ab ipſis comprehenſo, dabitur tertium *dc* quod quæritur; itaque aſſumpto triangulo *dac*, ſubtraho ang. *cab* ſuperius expreſſum 40 gr. 49 ſcr. ab angulo *dab* 124 gr. 20 ſcr. & venit angulus *dac* 83 gr. 31 ſcr. unde per propoſ. 14 lib. 2. conſ. 3. erit

ut ſinus totus ad ſinum compl. ang. dati *a*
10000000 1129142
ita duplex rectang. ſub cruribus, *da ac* ad diff. inter quadrata crurum & baſis, *dc*.
43818656 4947748

& quia angulus datus acutus eſt, ſubtrahatur hæc differentia à quadratis crurum 44278340, reſiduum erit quadratum baſis 39330592, cujus radix 6271 eſt ipſa quantitas baſis *dc* quæſitę nempe 627 decemp. 1 pedis.

Eandem prorſus quantitatem nobis exhibet 4 conſ. ejuſdem propoſ. ſi namque fiat

ut radius ad ſinum verſum ang. *a* ita duplex rectang. crurum
10000000 8870858 43818656

ad ex-

ad exceſſum quo quadr. baſis excedit quad. differentiæ crurum 38870907 & huic addatur quadratum differentiæ crurum 678 ſcilicet 459684, proveniet baſis quadratum 39330591 cujus radix ut ante eſt ipſa baſis. Si alicui jam porrò libeat, eandem *dc* inveſtigare beneficio triang. *dbc*, is auferat angulum *abd* ab angulo *abc* & in cæteris eandem inſiſtat viam, aut per prop. 13 lib. 2. inveniat primo angulos ſingulos in triangulo *dac*, ſcilicet & *adc* & *dca*, poſtea per prop. 5. ejuſdem beneficio ſinuum facile innoteſcet baſis *dc*.

Secundo ſi ſtationes quidem dentur ad *a* & *b*; *dc* vero diſtantia quærenda, in directum ita objiciatur, ut ſtanti in alterutro termino *a* aut *b*, uterque locus ſit à parte eadem, dextrâ aut ſiniſtrâ, tunc obſervatis angulis *dab* & *dba*, item *cab* & *cba*, inveſtigantur latera *ad* & *db*, *ac* & *bc*, quibus habitis, ſi alteruter angulorum priorum, ab horum alterutro ſubtrahatur, ſcilicet *dab* à *cab*, vel *dba* à *cba*, dabuntur in triangulo *cdb* vel *cda*, duo latera cum ang. ab ipſis comprehenſo, unde tertium facile inveniri poterit, oſtendens diſtantiam locorum quæſitam.

Exempli gratia, ſi detur *ab* 244 decemp. 6 pedum, angulus *dab* 35 gr. 30 ſcr. *dba* 46 gr. 15 ſcr. dabitur hinc reliquus *adb* 98 grad. 15 ſcr. cujus ſinus 9896514. Fiat ergo

ut ſinus ang. *d*.	ad *ab*	ita ſinus *a*,	ad *db*,
9896514	244.6	5830687	146.1.
& ſinus *b*.		ad latus *ad*.	
7223640		178.5.	

Deinde ſi detur angulus *cab* 56 gr. 42 ſcr. & *cba* 63 gr. 51 ſcr. dabitur tertius *acb* 59 gr. 27 ſcr. unde erit iterum

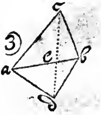
G 3 ut ſi-

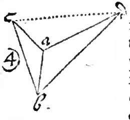
ut ſinus *acb*, ad *ab*, ita ſinus *cab*, ad *bc* & ſinus *cba*
8611859 244.6. 8358074 237.3 8976433
ad latus *ca*. 254.9.

Porro ſubtrahatur angulus *dab* ab angulo *cab*, vel angulus *dba* ab ang. *cba* & manebit *cad* 21 gr. 12 ſcr. & *cbd* 17 gr. 36 ſcr. nos tantum ſumemus nunc triangulum *cad*, in quo datur angulus ad *a*, cum duobus lateribus ipſum comprehendentibus, *ca* 2549. & *da* 1785. erit ergo

ut ſinus totus, ad ſinum compl. anguli *a*.
10000000 9323238
ita duplum rectang. ad differ. inter quad. crur.
crurum, & quad. baſis
9099930 848081,

hanc ſi auferas à quadratis crurum 9683626, quia angulus datus eſt acutus, manebit quadratum baſis 1199545, cujus radix oſtendit baſin ipſam *cd*; diſtantiam ſcilicet duorum locorum quæſitam 109 decemp. 5 pedum.





Tertiò ſi ſtationes dentur ab utraque parte lineæ *cd*, ita ut *ba* candem interſecet; tunc quidem ſi detur acceſſus in *e*, utere probl. 4. in triangulo alterutro *cea* vel *ceb*, & *aed* aut *bed*: Sin vero acceſſus denegetur, ſed intervallum ſtationum aliunde (puta per obſervationem) ſit notum; tunc obſervatis angulis *cab*, *bad*, item *cba*, *abd*, inveſtigabis primo quantitatem linearum *ad*, *ac* vel *bd*, *bc*; Deinde verò in triangulo *cbd* vel *cad* ex datis duobus lateribus & angulo ab ipſis comprehenſo, concludes

cludes *cd* ſicut in præcedentibus. Nos unico duntaxat exemplo rem illuſtrabimus: ſint obſervati anguli, *cab* 62 gr. 25 ſcr. *bad* 23 gr. 12 ſcr. Item *cba* 68 gr. 36 ſcr. *abd* 40 gr. 29 ſcr. jam in triangulo *acb* invento tertio angulo ad *c* 48 gr. 59 ſcr. Fiat

ut ſin. ang. *c*, ad latus *ab*, ita ſin. ang. *b*, ad latus *ca*
7545187 244.6. 9310558 252.9.

In triangulo vero *adb*, datis angulis ad *a* & *b*, invenitur tertius ad *d*, 116 gr. 19 ſcr. erit itaque

ut ſinus ang. *d*, ad *ab* ita ſinus ang. *b*, ad latus *ad*
8963575 244.6. 6492268 178.1.

Denique pro invenienda baſi *cd*, in triang. *cad*, Fiat

ut ſinus totus, ad ſinum comp. ang. *a*, 85 gr. 37 ſcr.
10000000 764290
ita duplum rect. crurum, *ac*, *ad*. ad diff. inter quadr. crurum & baſis,
9008298 688495,

ſumma quadratorum crurum eſt 9567802 unde præcedens differentia deducta quia ang. *a* eſt acutus, dat quadratum baſis 8879307, & proinde ipſam diſtantiam *cd* 297 decemp. 9 pedum.

Quartò ſi intervallum ſtationum ab unâ tantum parte lineæ quæ duo loca menſuranda connectit, concedatur, ut *ab*; tum obſervatis angulis *cba*, & *abd*; item *dab* & *cab*, in utroque iſto triangulo colliguntur crura *ca* & *da*, ideoque dato angulo *cad*, dabitur baſis *cd* ut ante. Potuiſſem quidem hic ſubſiſtere & in præcedentibus exempla calculi omiſiſſe, ne inutilis videretur περιεργία, quippe in omnibus eiſdem utendum eſt propoſitionibus, attamen ut rudioribus hanc viam præeam, etiam hoc poſtremum exemplum numeris ſubducam: eſto ergo *ab* ut ante 244.6. angulus *cba* 36 grad. 45 ſcr. & *abd* 29 gr. 32 ſcr. Item angulus *cab* 119 gr. 23 ſcr.

& *dab* 138 grad. 50 ſcr. jam in triangulo *cab* datis duobus angulis ad *a* & *b*, dabitur tertius ad *c* 23 gr. 52 ſcr. eritque

ut ſin.ang.*c*,	ad latus *ab*,	ita ſin.ang.*b*,	ad latus *ad*.
4046096	244.6.	5983246	361 7.

Deinde in triangulo *dab*, datis duobus angulis ad *a* & *b*, dabitur tertius ad *d* 11 gr. 38 ſcr. Atque ideo erit

ut ſin.ang.*d*,	ad latus *ab*,	ita ſin.ang.*b*.	ad latus *ad*.
2016478	244.6.	4929298	597.9.

Denique ſubtracto utroque angulo *cab* & *dab* à toto circulo dabitur angulus *cad* 101 gr. 47 ſcr. ideoque datis lateribus *ac* & *ad* erit

ut radius,	ad ſin.compl.ang. dati	ita duplex rect. crurum.
10000000	2042113	43252086

ad differ. inter quad. crurum & baſis.
8832564

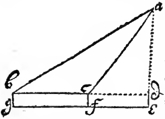
Hæc differentia addita ad quadrata crurum 48831130, quia ang. *cad* obtuſus eſt, dat quadratum baſis 57663694, cujus radix 759. decemp. 3 ped. eſt ipſa diſtantia *cd* quam quærebamus; Poſſet idem perfici beneficio anguli *cbd* & laterum *cb*, *bd*, quæ ſeorſim ut ſuprà *ca* & *ad* facile invenirentur; ſed tollo nunc manum de tabula, prius tamen monendum ratus, baſin *ab* in omni caſu ſi fieri poſſit, aſſumendam ſatis magnam, ne anguli ad *c* & *d*, nimis acuti evadant: ob hanc enim cauſam facilis eſt lapſus, cum error ex minori termino, tandem in majoribus multiplici calculo ſenſibiliter augeatur, idque eo magis ſi non uſque adeo magno utaris inſtrumento in dimetiendis angulis.

VII. PRO-

VII. PROBLEMA.

Altitudinem rei inacceſſæ dimetiri, conceſſis duabus ſtationibus liberis in ſuperficie plana, cui res menſuranda perpendiculariter inſiſtit.

SUPERFICIEM planam voco, quæ nullis collibus aut aſperitatibus extollitur, ſed æqualiſſima eſt, adeo ut exactè menſurari poſſit linea recta inter utramque ſtationẽ interjecta; quæ alioqui per calculum aliunde inveſtigari deberet, poſitis baculis ſupra aſperitates extantibus, ſicut hæc experiunti ad oculum facillimè apparent. In tali ergo ſuperficie *ge*, ſumptæ ſint duæ ſtationes *g* & *f* inter ſe diſtantes 20 decemp. & ſit rei menſurandæ altitudo *ae*; ſtationibus *g* & *f* infigantur baculi *bg cf* ex quibus ſuſpenſo inſtrumento pari altitudine, obſervatus ſit angulus *acd* 32 gr. 20 ſcr. & *abd* 26 gr. 35 ſcr. & ſublato ang. *abd*, ab angulo *acd*, detur *bac* 5 gr. 45 ſcr. Erit itaque per prop. 6 lib. 2. in triangulo *bca*,



ut ſin. ang. *a*	ad latus *bc*,	ita ſin. ang. *b*,	ad latus *ac*
1001881	20 dec.	4474990	80 dec. 5

ped. 3 dig. Et iterum per propoſ. 2 lib. 2.

ut radius,	ad ſinum ang. *acd*	ita *ac*,	ad, *ad*,
10000000	5348440,	89.3.3.	47.7.7.

Cui ſi addatur altitudo baculi, ſeu *de* 5 ped. venit altitudo quæſita *ae* 48 decemp. 2 ped. 7 dig. eadem

dem opera ex *ac* & angulo *cad*, colliges *cd* diſtantiam perpendiculi *ae* à proximâ ſtatione, ſi quidem id expetes ; quod aliquando ſuo uſu non caret. Aliter vulgo hoc fieri ſolet per tangentes; cum enim dentur anguli *acd abd*, dabuntur quoque *cad*, *bad*, quorum tangentes ſunt *dc db*, & differentia *bc*; ergo ut differentia tangentium, ad radium, ita intervallum ſtationum *bc*, ad altitudinem *ad*, cui ſemper addenda eſt *cf* ſeu *de*, altitudo baculi.

Eadem & ſimili plane praxi, ſimul & eodem tempore per duos menſores, dimetiemur altitudinem alicujus nubis, modo ea lenti motus ſit, & evidentem in extremitatibus ſortiatur denſitatem; nam in medium ejus viſus non poteſt bene dirigi ſine errore, quem etiamnum vix effugiet is, qui non omni induſtriâ & circumſpectè rem aggreditur: Exemplum unum addam ob diligentiam fide dignum, 8 Iulij ſtylo novo anni hujus 1627, vento boreali, obſervavimus altitudinem nubis cujuſdam, ad votum diſtinctæ & lenti motus; fuitque inventus angulus *abd* 31 gr. 40 ſcr. *acd* 38 gr. 30 ſcr. intervallum autem ſtationum aſſumptarum fuit 1680 pedum Rhijnlandicorum in campo plano; ex his igitur dato ang. *bac* 6 gr. 50 ſcr. erit per eandem prop. lib. 2.

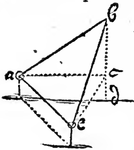
ut ſinus *bac*,	ad *bc*,	ita ſinus *abc*,	ad *ac*
1189816	1680	5249766	7412.

& rurſus

ut radius,	ad ſinum ang. *acd*,	Ita *ac*	ad *ad*
10000000	6225146	7412	4614

Huic ſi addas altit. *cf* 6 ped. provenit altitudo nubis 4620 pedum, qualium 12 faciunt decempedam hactenus uſurpatam: quod certâ de cauſâ fecimus; cum

cum namque in milliari germanico, quorum 15 uni gradui circ. maximi in terra reſpondent, ſint pedes 22800, aſſurgit iſta altitudo ad $\frac{1}{5}$ unius milliaris & paulo amplius; in milliaribus autem Hollandicis cum ſint pedes 18000 erit altitudo iſta $\frac{1}{4}$ mill. & 120 circiter pedum.



Verumenimvero ſi res menſuranda ita ſita ſit, ut nullo modo baſis inter duas ſtationes, tendere poſſit in directum perpendiculi, ſed eandem tranſverſim aſſumere liceat ad libitum; tum inſtrumento ita inclinato (in præſenti diagrammate) ut reſpondeat plano trianguli *abe* hoc eſt ut per dioptras ſimul intueri poſſis rei menſurandæ cacumen *b*, & alteram ſtationem *a*, dimetire primò angulum *aeb*, qui hoc caſu detur 57 gr. 30 ſcr. inde ſimili modo angulum *bae*, qui ſit 69 gr. 42 ſcr. & tunc datâ baſi *ae* 30 decemp. cum tertio angulo *abe* 52 gr. 48 ſcr. dic ut ſuprà

ut ſinus ang. *b*.	ad latus *ae*,	ita ſinus ang. *a*,
7965299	30 dec.	9378889

ad latus *be* 35 dec. 3 ped. 2 dig.

habitoque latere *be*, ſume quadrantem Aſtron. cum perpendiculo, & per inſtrumenti dioptras quæ in *b* reſpiciunt, accipe ang. *bec*, ſeu altit. ſupra horizontem qui hic ſit 24 gr. 15 ſcr. & cum *bce* rectus ſit, dic iterum ut ſuprà

ut radius,	ad ſinum ang. *bec*	ita *be*	ad *bc*
10000000	4107188	35.3.2.	14.5.0.

eique adde altit. baculi pro *cd* 5 ped. veniet vera rei altitudo *bd* 15 decempedarum.

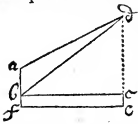
Iucunda & utilis ſane hæc praxis eſt, cum in menſurandis altitud. turrium aut ædificiorum, raro baſis in directum concedatur. Si tamen in nubibus hanc adhibere velis, ſcias ante omnia diligentem te eſſe oportere, nubemque tardiſſimi motus: nam iſtic omnia momento exæquenda ipſe expertus, ſæpe fruſtra fui, ni prius inſtrumenti planum ad certam aliquam inclinationem collocaſſem, quod imitari poteris: in turribus enim alia res eſt, utpote quæ uni loco inhærentes, ſpatium accuratè omnia adminiſtrandi concedunt. Non invitus etiam hoc moneo, ſi vulgaribus utaris inſtrumentis baculo plane affixis, ipſum baculum eſſe inclinandum atque ita majores moleſtias objici; & propterea expedire, ut ad modum ſextantis Tychonici inſtrumentum præparetur quod immoto baculo facillime ad quodvis planum inclinari poſſit; ſimul etiam ut dioptræ non ſolis rimulis, ſed in medio parvo quoque foramine pertuſæ ſint, quo certius quadrante altitudinem rei per illa foramina accipias; Denique ut in menſurandis nubium altitud. baſis in terra planâ, accipiatur evidentis magnitudinis reſpectu linearum *be* & *bd*, ne ſcilicet angulus *abe* nimium acutus evadat, quod ſi fieri poteſt omnino præcavendum eſt.

VIII. PROBLEMA.

Altitudinem rei invenire per baſin datam in planitie verticali, non autem horizontali.

HACTENUS explicuimus modum menſurandi res ſublimes, per duas ſtationes in plano horizontali, nunc vero eandem explicare aggredimur datis

datis ſtationibus in plano verticali hoc eſt tali plano quod horizonti perpendiculare eſt, & in quo linea ſtationum in zenith incurrit; cujus quidem modi praxis omnes alias commoditate ſuperat, quippe ex ædificio, muro, turri, aut malo inſtitui quovis ſolo & cœlo poteſt, licet arbores, montes, aut quidvis aliud rem menſurandam penitus fere intercludant. Quapropter in diagrammate ſequenti ſit alt. menſuranda *ed*, prima ſtatio in *f*, inſtrumentum a. in *b*, & obſervato angulo *dbc* 40 gr. 32 ſcr. ſit ſecunda ſtatio in *a* ibique rurſus obſervato angulo quo linea *ad*, ſupra planum horiz. aſſurgit, addo ipſi 90 gradus ut habeam obtuſum *dab*, aut ſumo ejus complementum ut habeam exteriorem ad *a*, qui nunc ſit 62 gr. 54 ſcr. ex obtuſo itaque, aut exteriore hoc angulo, & dato *dbc*, inquiro ang. *adb* qui hic eſt 13 gr. 16 ſcr. Deinde menſurato ſtationum intervallo 16 decemp. Dico per prop. 6 lib. 2.



ut ſinus ang. *adb*. ad *ab*, ita ſinus ang. *dab* vel ejus
13 gr. 26 ſcr. 16 decemp. reſidui 62 gr. 54 ſcr.
2323138 8902128
ad latus *bd* 61 dec. 3 ped. 1 dig.

& rurſus per prop. 2 lib. 2.

ut radius ad ſin. ang. *dbc* 40 gr. 32 ſcr. ita latus *bd*,
10000000 6498803 61.3.1.
ad *dc* 39.8.4.

Cui ſi addatur altitudo inſtrumenti pro *ce*, 5 ped. venit alt. quæſita 40 decemp. 3 ped. 4 dig. Et hæc ſunt problemata quæ Trigonometriæ planorū Claviſſ. D. SNELLII ſubjungere viſum fuit, in quibus ſi non

ſi non omnium, præcipuarum ſaltem propoſ. uſus elucеſcit, neque enim animus fuit univerſam percurrere Geodæſiam, cum pleraq; problemata adeo facilia ſint ut bene intellectis propoſ. tang. & ſecantium, quivis ea ad praxin revocare poſſit, itaque optandum mihi reſtat, ut tu modo benigne Lector tali animo hæc excipias, quali à me offeruntur, & ſtudiis noſtris juvenilibus favens ſtimulos addas, ad majora ſuo tempore Deo dante progrediendi.

FINIS.

DOCTRI-

DOCTRINÆ TRIANGVLORVM CANONICÆ,

Liber Tertivs.

De Triplevris *ſphæricis.*

AD Tripleurorum ſphæricorum doctrinam, quædam è generaliori ſphæricæ doctrinæ theorijs nobis ſunt repetenda, ut eorum uſus ſit in promptu: Nam illa, Si ſphæra plano ſecetur, communem ſectionem eſſe circulum; & præterea de maximis circulis, eos & ſe mutuo, & ſphæram biſecare; minores non item, nimis operoſum, ne dicam ineptum ſit hic referre: Sed tamen iſtud quod ſequitur primum nobis obtineat locum, quia in laterum & angulorum permutatione, & horum etiam dimenſione uſum habet ſingularem.

I. Propositio.

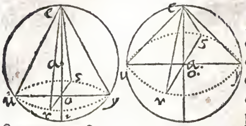
Maximus circulus maximi quadrantis intervallo in ſphæra deſcribitur, è 16 & 17. l. 1. Theod.

Concipiatvr enim diametro ſphæræ maximus circulus per ſphæræ centrum perpendicularis; itaque omnes in illo plano rectæ per centrum eductæ primæ diametro erunt perpendiculares

res & æquales; atque ideo earum ſemiſſes: & cum ad angulos rectos ſint, ſubtenſæ ab apice primæ ad harum terminos, æquales lateri inſcripti quadrati, & peripheriæ ergo ab his ſubtenſæ quadranti maximi circuli æquales erunt.

II. Propositio.

Si è quatuor punctis, duobus nempe polis, centro ſphæræ, centro circuli, recta linea duo qualibet connectat, ea per reliqua duo puncta ſuo circulo normalis tranſibit. Et, ſi recta ſubiecto circulo normalis per unum horum punctorum tranſeat, per reliqua quoque tranſibit. è 2.7.8.9.10. Theodoſij & earum corollarijs.



In ſphæra *euiy*, cujus centrum *a*, eſto circulus *urys*, cujus centrum *o*, & poli *e i*. ajo primum, rectam quæ *a* & *o* centra connectit, in priore diagrammate per *e i* polos tranſire ſubjecto circulo *urys* perpendicularem: cum enim radij ſphæræ *au ay*, *uo oy* radij circuli æquales ſint, & *ao* communis, triangula *aou*, *aoy*, erunt æquiangula & *aou aoy* anguli deinceps recti: eandem ob cauſam *aor aos* recti erunt, & ideo *ao* perpendicularis ſubjecto circulo. cum igitur *eo* ſit perpendicularis centro circuli *o*, omnes rectæ ab *e* ad peripheriam æquales erunt, res eadem eſt de puncto *i*. Si *e* & *i* poli connectantur, ergo *ei* diameter & per *a* ſphæræ centrum tranſit;

ſit; & perpendicularis quidem eſt plano quia ob inſcriptas *eu ui*, æquales inſcriptis *ey yi*; *eo* perpendicularis eſt ipſi *uy*, & ob eandem cauſam ipſi *rs*; atque ideo in communi ſectione perpendiculares: quare triangula, *ueo reo yeo* æquilatera, & *o* punctum, circuli centrum.

Res eadem erit ſi ſphæræ centrum cum polo connectas, quia per reliquum polum quoque diameter tranſit; At ſi polum cum centro circuli connectas, tum eadem perpendicularis erit circulo ob æqualitatem à polo ad peripheriam ſubjectam, atque ideo parte oppoſita rectæ ad eandem peripheriam inter ſe erunt æquales. & ita fiet polus circuli alter, quare & per centrum ſphæræ tranſibit.

Converſa quoque haud operoſius demonſtratur: ſi enim à centro ſphæræ perpendicularis ſit *ao*, cadet in centrum circuli, quia radij ſphæræ ſunt æquales *au ar ay*, & *ao* perpendicularis communis, quare *ou or oy* æquales erunt, & *o* punctum ipſius circuli centrum, *ao* ſe in polos induet.

Nec difficilius erit evincere rectam à polo *e*, circulo perpendicularem, in ejus centrum incidere, & propterea per directam partem in reliqua duo puncta ſe induere.

Itaque

III. PROPOSITIO.

Si maximus ſphæra circulus tranſeat per alicuius polos, eidem normalis eſt: & contra.

NAM in eodem diagrammate *euiy* circulus maximus tranſeat per polos minoris *urys*, in eius igitur plano eſt *ei* axis circuli ſubjecti *uys*. atqui ille per antecedentem ei perpendicularis, quare & circulus

culus per eum eductus. converſa ex antecedentis converſa quoque eſt manifeſta.

Itaque

I. Poli cujuſque circuli ſunt in concurſu maximorum circulorum eidem perpendicularium.

Cauſa ex antecedente eſt manifeſta, nec demonſtratione indiget: nam ſi ſinguli normales per polos tranſeant, in eorum itaque concurſu polos eſſe utique neceſſum eſt. Sed & iſtud accedat, quia facile, & noſtris demonſtrationibus oportunum eſt.

Et

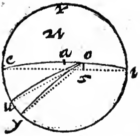
II. Si duo maximi circuli eidem maximo intra ſemiperipheriam inſiſtentes, angulos obtuſos cum eo comprehendant, diſtantia concurſus eorum à ſubjecto eſt major quadrante: ſi acutos, minor.

Nam ſi rectè inſiſtant concurrent in ipſo polo, ergo ſi uterque major ſit, vel alter rectus, reliquus obtuſus, ultra polum eorum concurſus excurret: ſin uterque acutus vel alter rectus reliquus acutus, citra. atque ideo illic erunt peripheriæ majores, hic minores.

IV. PROPOSITIO.

E maximarum peripheriarum ſegmentis, in ſphæræ ſuperficie ab eadem data peripheriæ parte, ad ipſam à puncto quod ab ipſius polo diverſum ſit eductarum, quod per polum educitur eſt maximum; reliquum maximæ minimū; maximæq; propius maius remotiore; & angulus à ductis & ſubiecta comprehenſus quâ minimum ſegmentum ſpectat eſt acutus; qua maximum obtuſus; & contra.

HOc analogia circulo plane reſpondet, neque prout inſtituimus, operoſiore multò demonſtratione



ſtratione opus habet: Sit enim circuli *euyi*, polus *a* & punctum datum *o*. Hinc peripheriæ ſunto ab *o* per polum *a*, *oae* & reliquum ejus *oi*; item ordine *ou*,*oy*; ajo *oae* eſſe maximam, *oi* minimam, *ou*,*oy*, ordine minores: cum enim *eaoi* maximus circulus per polos dati *eyi* tranſeat, eidem quoque erit perpendicularis: ſit itaque in ejus plano ſubjecto circulo perpendicularis *os*: cum ergo *se* quoque à puncto *s* non centro, per centrum tranſeat, *se* erit maxima omnium rectarum, *su*,*sy* ordine minores, & minima *si*. atque ideo rectæ ſubtenſæ *eo*, *uo*,*yo* ordine minores, minimaque omnium *oi*. atque ita parte altera *eri*, unicâ ſingulis intermediarum æquari poteſt. Secundũ membrum ſic patet, quia ſi ab *a* polo ducerentur peripheriæ, tum omnes eſſent ſubjectæ *euyi* normales, & ſegmenta ſemicirc. *ae*,*ai* quadrantes, ideoque anguli oppoſiti recti, jam vero cum maneat idem ſemicirc. *eai*, & crus *uo* vel *oy* non ſit normalis periph. *euyi*, quippe non ex polo ejus deſcendens, neque etiam ang. ad *u* aut *y* rectus eſſe poterit ſed obtuſus, reliquus autem *oui* vel *oyi* acutus reſiduum ſcilicet ang. *euo* vel *eyo*, ad ſemicirculum. Operoſius hæc ab aliis demonſtrantur, nos ſimplicitatem vitatis ambagibus conſectamur.

V. Propositio.

Tripleurum ſphæricum eſt quod à tribus maximorum circulorum peripherijs continetur.

Vides ex ipſa adeo definitione peripherias ſemicirculo æquales huic negotio ineptas eſſe, quia maximi circuli illic ſe mutuo biſecant, itaque tertio nullum hic eſſe locum; majores verò multo magis ſunt inidoneæ: ſin una ſemicirculo aſſumatur æqualis reliquæ ſimul majores, certe jam ex oppoſitis ad diametrum punctis, harum intervallo tantum paralleli deſcribentur circuli, neque uſpiam ſeſe interſecabunt. ſuper eſt itaque ut tertium latus quoque ſit ſemicirculo minus: nam ſi reliquum majus ſegmentum aſſumas, angulus verticis duobus rectis major eſſet. ut in antecedente diagrammate, ſi crura intelligas *io ou* & baſin *iyu*: tripleurum eſt ſphæricum; contra ſi ijſdem cruribus manentibus baſis aſſumatur *iru*, illud nobis in hunc cenſum non venit.

Itaque

I. *Tripleuri* duo quælibet latera reliquo ſunt majora. 6 pr. 1 Menelai.

Nam ſi tres anguli plani angulum ſolidum comprehendant, duo quilibet reliquo ſunt majores; quare etiam duæ peripheriæ, quibus iſti anguli in ſphæræ centro inſiſtunt, tertiâ erunt majores.

Et

II. *Tria* ſphærici tripleuri latera integro circulo ſunt minora. 7 pr. 1 Menelai.

Cum enim in antecedente diagrammate *eoi*, *eyi* peripheriæ ſint ſemicirculi, & in triangulo *oiy*, duo latera *oi* & *iy* ſint majora tertio *oy*, efficitur in triangulo

gulo *oey* tria latera *eo*,*ey*,*yo*,eſſe minora integro circulo; ſi enim æquarentur, tunc quia *eo* & *ey* communes ſunt ſemicirculis *eoi* & *eyi*, tertium latus *oy* reliquis ſegmentis *oi* & *iy* æquale eſſet, quod abſurdum.

VI. PROPOSITIO.

Angulus tripleuri ſpharici eſt planorum inclinationis angulus.

ANGVLVM inclinationis planorum acutum definit Euclides, nos pro angulo tripleuri, eum & acutum & rectum & obtuſum intelligimus: ita enim neceſſe eſt, & ſane ne Euclides ipſe quidem inclinationem linearum rectarum aliter adhibuit, quam pro angulo quocunque.

Itaque

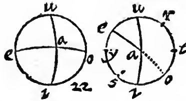
I. *Peripheria* ex angulo tanquam polo, intervallo quadrantis maximi circuli deſcripta, eum menſurat.

Notum eſt ex elementis rectas duas communi ſectioni duorum planorum, in eodem puncto perpendiculares, anguli inclinationis quantitatem explicare. atqui circulus è communi ſectione tanquam polo deſcriptus, eorum utrique eſt perpendicularis per prop. 3. quare illorum communis ſectio huic plano, & rectis ipſis erit perpendicularis; hic igitur angulus explicabit quantitatem inclinationis planorum: ſed & hoc centrum eſt ſphæræ & maximorum circulorum, ea igitur maximi circuli peripheria menſura eſt propoſiti anguli ſphærici: potuit idem ob ſimilitudinem peripheriarum de quovis parallelo intelligi, ſed hoc ad captum videtur

explicatius, quia omnia ad maximorum circulorum menſuram hic referimus. ſed & huc etiam alterum accedat conſectarium Ptolomæo l. 1. c. 10 uſitatum, & à Theone ad eum locum demonſtratum.

Et.

II. *Poli* crurum anguli recti ſunt in ipſis cruribus, & quadrans eum metitur. In *obtuſo*, qui intrà cadunt ſunt ejus menſuræ reſiduum; vel unius intrà alterius extra cadentis poli diſtantia ipſa menſura. In *acuto* autem diſtantia polorum ab eadem eiuſdem cruris parte; polorum autem trans crura diſtantia, ejus reſiduo eſt æqualis.



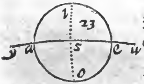
Sunto in ſphæra *ieuo* cujus polus *a*, maximi circuli *eao*, *iau* comprehendentes angulum rectum *eai*; itaque *ei* erit menſura anguli ad *a* recti. Et *ei* per utriuſque polos tranſibit ipſis normalis per propoſitionem 3. quare in concurſu perpendicularium *ei ai* polus eſt cruris *ae*, per conſ. prop. 3. Et eandem ob cauſam erit *e* punctum polus cruris. Et ſi crura aſſumantur majora aut minora quadrante veritas tamen eſt eadem, ut è dictis facile perſpicitur.

Sit in ſecundo diagrammate angulus *eai* obtuſus, & ex *a* polo maximus circulus deſcriptus *ieuo*, is utrique cruri perpendicularis per eorum quoque polos tranſibit. Et *ei* menſura anguli obtuſi *eai* major erit quadrante. ſunto igitur *iy* & *es* quadrantes. quare *y* erit polus circuli *ai* per 3 & 1 propoſ. & *s* circuli *ae*, caduntque intra crura obtuſi anguli *eai*. Si igitur crus unum *ia* continuetur in *u*, erit *ieu* ſemicirculus, & *eu* reſiduum ipſius *ei*, & *yu* quadrans:

drans : ſed & *ſe* quadrans eſt : ſublato igitur communi *ey*,reliqua *ſy* reliquæ *eu* æqualis erit. cum igitur *ſy* ſit reſiduum obtuſi, *ſl* erit ipſa menſura, diſtantia à polo interno *ſ* ad externum *l*. pars peripheriæ ſemicirculo minor.

Si angulus datus ſit acutus ut *eau*,jam peripheria *eu* erit quadrante minor. & ideo polus *y* ultra *e* cadet in *y*. & polus cruris *ea* cadet ultra hunc in *ſ*, quadrantes igitur erunt *uy es*, ſublatoque communi *ey*, reliqua polorum diſtantia reliquæ *eu*,quæ eſt auguli dati menſura æqualis erit. Et ſi *er* itidem ſit quadrans diſtantia polorum trans crura utrimque *yr* erit ejus menſuræ reſiduum ad ſemicirculum.

III. *Tripleuri* ſphærici cruribus porrò & retrò continuatis,& angulus ad verticem, & oppoſitus eidem æquantur.



Sunto duo crura anguli in ſuperficie ſphæræ, *ſe*, *ie*, & *es* continuetur porro ultrà in *u*, & retro in *a*. ajo angulos ad verticem *ies*,*oeu* æquari,itemque oppoſitos *ies*, *ias* ; Si enim ex *e* vel *a* tanquam polo deſcribatur maximi circuli peripheria *iso*, erit utique *is* menſura anguli *ies*,itemque anguli *ias*, per conſ. 2 pr. 6. iſti igitur inter ſe æquales erunt ; ſed *ies*, *oeu*, ad verticem poſiti, ſiquidem *ſeo* utrilibet eorum additus, duos cum eo rectos impleat, ſublato communi etiam inter ſe æquales erunt. Hujus conſectarij uſus eſt ſæpè κατ' ἀναπλήρωσιν, cum manente baſe dati trianguli,pro datis cruribus eorum ad ſemicirculum reſidua uſurpantur.

VII. PROPOSITIO.

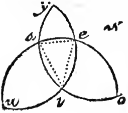
Angulus inclinationis circulorum in ſphæra, maior eſt angulo à rectis in eas inſcriptis comprehenſo.

IN diagrammate ſequenti, ſint tres quadrantes *ae*, *ei*, *ia*, comprehendentes triang. æquilaterum ſibi inſcriptum: jam quia angulus ſphæricus eſt ipſa planorum inclinatio, quorum vertices coëunt in centro ſphæræ, erunt tria plana horum circulorum ad ſe mutuo recta, & triang. planum ad hæc ſingula obliquum; ſumantur ergo in ejus lateribus, intervalla crurum anguli recti quem hic duo plana circulorum faciunt, & transferantur in latera alicujus ang. ab inſcriptis facti; eritque ang. inclin. planorum, major angulo triang. æquicruri, hac crurum tranſlatione geniti, quia ipſe ſubtenditur à toto latere huius, hic vero jam à linea minori, & angulus ang. æquicrurus ſi ſit major baſi, major quoque eſt, ut patet ex elementis.

CONSECTARIVM I.

Itaque

Tripleuri ſphærici tres anguli duobus quidem rectis maiores, at ſex rectis minores ſunt. 20 *pr. lib.* 1. *Menelai.*



INSCRIBANTVR tres rectæ ſubtendentes latera tripleuri ſphærici *aei*, ex comprehendent triangulum rectilineum *aei*: atqui, ut jam oſtendimus, ſinguli anguli trianguli, ſingu-

ſingulis tripleuri ſunt minores, quare tres anguli trianguli qui duobus rectis ſemper æquales ſunt, tribus angulis tripleuri minores erunt.

Sed & tres tripleuri anguli minores ſunt ſex rectis; quia angulus omnis inclinationis planorum minor eſt duobus rectis; itaque tres anguli tripleuri etiam obtuſiſſimi, ſex rectis minores erunt.

CONSECTARIVM II.

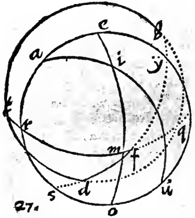
Itaque

Vt è datis tribus angulis tripleurum deformetur, neceſſum eſt, ut ipſi omnes inſimul, & duorum quorumcunque reſidua, addito tertio, duos rectos excedant.

RESIDVVM ut ſæpè antea à nobis dictum, eſt 180 graduum exceſſus ſupra datam peripheriam, angulumve datum: Sit enim in eodem triangulo *aei*, angulus *a* 130 gr. *e* 140 gr. *i* 60 gr. utique tres iſtos angulos duobus rectis majores eſſe nemo dubitat; attamen ineptum ut hinç tripleurum deformari poſſit: Nam triangulum *yae* quod per hujus ἀναπλήρωσιν efformatur, habebit angulum *y* æqualem *i* per conſ. 3 propoſ. 6. 60 gr. *a* prioris reſiduum 50 gr. & *e* prioris reſiduum 40 grad. atqui hi numeri additi conflant nobis 150 gr. minus nempe duobus rectis. Quare data iſta erunt inidonea; quod monuiſſe operæ videbatur pretium.

VIII. PROPOSITIO.

Si ex angulis dati tripleuri tanquam polis, maximi circuli deſcribantur, comprehendent tripleurum cuius latera & anguli, laterum & angulorum primo datorum reſiduis reciproce reſpondeant.

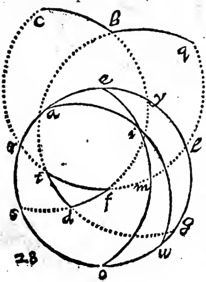


27.

ESTO primum tripleurum acutangulum *aei*, cujus ideo latera omnia quadrante ſunt minora per conſ. 2. propoſ. 3. & ex *a* polo deſcribatur maximus circulus *sdy*; ex *e*, *rml*; ex *i*, *tdqb*; quare in concurſu *eo sy* circulorum ad *ae* perpendicularium, nempe in *f* polus erit circuli *ae*, is igitur abſolvatur ex hoc polo: & in concurſu *td lr*, nempe in *t* erit polus circuli *eio*, & denique in *d*, & in *b* polus *aiu*, hinc fiet triangulum *tſb* quale diximus. Cum igitur angulus *aei* ſit acutus ex hypotheſi, *t* polus *ei*, *f* polus *ae* utrimque trans crura cadet & erit *tf* reſiduum anguli *aei* ad ſemicirculum per 2 & 3 conſ. prop 6. Itemque *f d* poli cadent ab eadem parte extra crura acuti *iae*, & erit ejus menſura. atque *dt* poli cadent ab eadem parte extra crura acuti *aie*, & horum diſtantia *td* erit ejus menſura per 2 & 3 conſ. p. 6. At verò quemadmodum latus *tf* reſpondet reſiduo anguli *aei* ad ſemicirculum,

lum, ita quoque angulus *tbf* illi oppoſitus reſpondet reſiduo *ai* ad ſemicirculum: nam *ai* latus quadrante minus eſt, & ideo *td* crus anguli ex polo *i* deſcriptum complectitur *a* polum cruris *fb*, & eodem modo *fb i* intra continebit, quare *ai* polorum diſtantia æquabitur reſiduo anguli *tbf* ad ſemicirculum, vel angulus *tbf* æquabitur reſiduo *ai* lateris ad ſemicirculum; id enim idem eſt. Eodem modo concludes *ftb* reſiduo *ie* ad ſemicirculum, & *tfb* reſiduo lateris *ae* ad ſemicirculum æquari.

Res eadem eſt ſi duo ſint obtuſi cum uno acuto ut in eodem diagrammate in triangulo ad baſin *aoi* oppoſito. hic *o* acutus eſt reliqui obtuſi; huic reſpondet triangulum *tdf*, ut enim ipſum triangulum *aoi* & latera & angulos habet ad ſemicirculum reliquos trianguli *aei*, præter commune latus *ai*, & angulum, *o* oppoſito *e* æqualem; ita quoque *tfd* reſpondet ipſi *tfb*; quare *tfb* angulos & latera habet lateribus & angulis trianguli *aoi* ad ſemicirculi reſiduum reſpondentia.



28

Si triangulum habeat unũ obtuſum & duos acutos res erit eadẽ, ut ſi in ſecundo diagrammate angulus *aei* ſit obtuſus. ergo *f* polus *ae*, *t* polus *ei*, cadent intra crura *aei*, & *tf* erit reſiduum *aei* ad ſemicirculum, reliqua ut prius: quare *tbf* habebit & latera

 & an-

& angulos oppoſitos, reſpondentes trianguli *aei* laterum & angulorum oppoſitorum reſiduis ad ſemicirculum.

Si triangulum ſit merè obtuſangulum, ut *aoi*, res erit eadem, quæ in ſecundo primi diagrammatis membro, nam *tdf* illi ſimili analogia reſpondebit.

In rectangulis res eadem eſt & angulus rectus convertitur in quadrantem: nam quadrans à ſemicirculo quadrante diſtat.

Theorema hoc perutile eſt & ſequentibus demonſtrationibus libri 4 peroportunum, atque à pleriſque varie ſollicitatum, ac legibus non neceſſariis alligatum: quod nos ijs vinculis liberatum generaliter hic proponimus. Sed exemplum quoque in hoc ſchemate numeris aptatum accipito, quo facilius ſummam animo concipias. Eſto tripleurum *aei* cujus latera ſint *ae* 32 gr. 45 ſcr. *ei* 54 gr. 26 ſcr. *ai* 83 gr. 50 ſcr. & deſcriptis circ. maximis *rael*, *eimo*, *aiu*, fiet anguli *tfd* menſura *rf*, æqualis diſtantiæ polorum *ae*, ejuſque reſiduum *ry*, erit menſura anguli *tfb*, qui proinde datur 147 gr. 15 ſcr. & eſt æqualis reſiduo cruris *ae*: ſimiliter quoque anguli *ftd*, menſura, fiet æqualis diſtantiæ *ei*; & reſiduum *io* menſura anguli *ftb* 125 gr. 35 ſcr. Denique ang. *fdt*, reſiduum erit diſtantiæ *ai* ſeu anguli *tds* qui æquantur, ideoque angulus ad *b* reſiduo *ai* ſcil. 96 gr. 10 ſcr. æquabitur: trianguli itaque *tbf*, ſinguli anguli, ſingulis laterum triang. *aei* reſiduis reſpondent: quod ſi dentur anguli trianguli *aei*, tum reſiduo ang. *aei*, crus *tf*, reſiduo vero *eai* crus *fb*, denique reſiduo *eia* crus *tb* in triang. *tbf* æquari, manifeſtum eſt ex antecedentibus.

IX. PRO-

IX. PROPOSITIO.

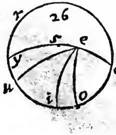
Tripleurum ſphæricum rectangulum eſt, quod ſaltem unicum habet angulum rectum; acutangulum quod omnes acutos; obtuſangulum quod vel omnes obtuſos, vel acutos & obtuſos mixtim habet.

EA eſt anguli recti prærogativa, ut ubicunque ſe vel ſemel tantum interponat, triangulum ſit rectangulum; reliqui acuti an obtuſi ſint nihil intereſt. acutangulum triangulum omnes congeneres ſibi depoſcit. obtuſangulum ſolum rectum angulum reſpuit, acutum vero & unum & alterum admittit; quod inde exiſtit, quia tres anguli tripleuri rectis quidem duobus majores, at ſex rectis minores ſunt, in planis ſecus eſt: ibi enim tres anguli trianguli ſemper & inter ſe & duobus rectis ſunt æquales.

X. PROPOSITIO.

Crura tripleuri rectanguli ſunt eiuſdem affectionis cuius ſunt anguli ipſis oppoſiti. & contra 11 *p. l. Geb.*

HOc eſt ſi recti crus ſit quadrãs circuli, angulus ei oppoſitus quoq; rectus erit: ſi quadrãte majus obtuſus: ſin minus, acutus, & cõtra. Ego hic partẽ converſam primo loco demõſtrabo: Sit enim angulus *eai* rectus, quare *ae* tranſibit per polos circuli *ai*, & viciſſim *ai* per polos *ae* per propoſ. 3. ſi itaque crus *ai* ſit quadrans, tum *i* punctum erit polus circuli *ae*; atque ideo *ei* quo-



ei quoque quadrans erit. ſin ut in triangulo *eao*, crus *ao* minus ſit quadrante, quia *eo* cadit citra *i*, & *e* non eſt polus, *eo* minor erit quam *ei*, & ita *eu* major quam *ei* per propoſ. 4.

Et contra ſi angulus *iea*, ad baſin *ie* poſitus, rectus ſit, *ei* baſis & *ea* crus quadrantes erunt per prop. 1. nam in eorum concurſu *i* eſt polus circuli *ae* per conſ. 1. propoſitionis 3.

Si angulus *uea* ſit obtuſus, *ue* baſis in triangulo *eau* major erit quam *ei* per propoſ. 4. Et ſimiliter in triangulo *eao*; ſi *oea* ſit acutus, baſis *eo* quadrante erit minor per eandem 4.

Exemplum memoriæ poteris concipere in æquinoctiali & ecliptico circulo, ſi alibi atque alibi à meridiano interſectos intelligas.

XI. PROPOSITIO.

Si rectanguli tripleuri, crus alterum ſit quadrans circuli, etiam baſis quadrans erit: ſin utrumque ſit affectionis eiuſdem in exceſſu aut defectu baſis erit quadrante minor: ſin diverſæ maior. & contra è 4 & 5 pr. lib. 4 Regiomont.

IN eodem diagrammate ſit *eai* tripleurum cujus angulus ad *a* ſit rectus, & ſit crus *ai* quadrans, ergo per 1 propoſ. *i* polus erit circuli *ae*, & ideo *ie* quadrans.

Sunto jam crura *ea ao* ambo minora, quare *eo*, cum cadat citra *ei*, erit minor quam *ei* per prop. 4. Idem erit ſi ambo ſumantur majora, ut in triangulo *eyo*: nam *eyo*, *eao*, anguli æquales, recti nempe ſunt per 3 conſ. prop. 6. & baſis *eo* utrique communis, jam minor eſt oſtenſa quadrante *ei*.

Sin

Sin *ea* crus ſit minus, & *au* majus quam *ai*; jam *ue* major erit quam *ei* per eandem 4.

Converſæ iſtarum in eodem diagrammate manifeſtæ erunt: Sit enim angulus ad *a* rectus, & ſit *ei* circuli quadrans; ajo crus *ia* quoque quadrantem eſſe: ſi enim *ai* majus aut minus eſſet quadrante, jam per directam partis ſecundæ *ei* baſis quoque quadrante eſſet major aut minor, quod eſt contra theſin.

At ſi ut in triangulo *eao*, baſis recti *eo* ſit minor quadrante; ajo crus utrumque *ea ao* eſſe affectionis ejuſdem: nam ſi *ei* quadrans ſit, & *ai* quadrans erit per prop. 9. at baſis minor eſt quadrante, per theſin, ſi itaque *ea* crus quadrante ſit minus *eo* cadet citra *i* per propoſ. 4 converſam; quare *ao* quoque quadrante minor erit. ſi vero ut in triangulo *eyo*, *ey* crus majus ſit quadrante, reliquum *yo* quoque majus erit: hoc, enim ex minore *eao* conſtat κατ' ἀναπλήρωσιν.

Denique, ſi baſis *eu* major ſit quadrante crura *ea au* erunt affectionis diverſæ; cum enim *ue* baſis recti quadrante ſit major, *e* non erit polus circuli *aou*, ſecus enim *eu* quadrans eſſet contra theſin, quare *ea* minus erit quadrante & *ey* majus: ſtatuatur itaque *ei* quadrans à puncto *e*, & *ai* igitur per primam partem quadrans erit, quare per conv. 4 prop. *eu* ultra *ei* occurret ſemicirculo *aoy*. & *au* majus erit quadrante; & crura *ea au* affectionis diverſæ, nempe alterum majus & alterum quadrante minus, quod erat demonſtrandum. operoſius iſta à Regiomontano & alijs oſtenduntur: ſed hæc formula mihi viſa eſt planiſſima. Exemplum tibi iterum ut ante in æquinoctiali & ecliptica concipito.

XII. PRO-

XII. Propoſitio.

Si rectanguli tripleuri, alteruter angulorum in baſi rectus ſit, baſis erit quadrans; ſin uterque affectionis eiuſdem, minor; ſi diverſæ maior. & contra. è 6 & 7. l. 4 Regiom.

VT in eodem diagrammate, Si in tripleuro *eai*, angulus *a* rectus ſit, & præterea angulus *e* ad baſin *ie* poſitus; tum *ie* baſis quoque quadrans erit, quia per 3 prop. conſect. *i* polus eſt circuli *ae*.

Si autem uterque angulus ad baſin ſit acutus ut in tripleuro *oea*, tum per propoſ. 9. crura oppoſita erunt minora; aut ſi uterque obtuſus majora quadrante, atque ideo per 10 pr. baſis *eo* quadrante minor.

Sin verò anguli ad baſin, ut in triangulo *eau*, ſint affectionis diverſæ; ut *uea* obtuſus & *eua* acutus, tum per 9 pr. *au* crus majus, & *eu* erit minus: atque ideo per 10 baſis *ue* quadrante major.

Converſa quoque ita patet: nam ſi in tripleuro *eai*, *ei* baſis ſit quadrans, & crus *ai* quadrans erit, atque ideo per 9 angulus *iea* rectus.

Si ut in tripleuro *eao*, baſis *eo* ſit quadrante minor, crura *ea ao* erunt affectionis ejuſdem, per 10. atque ideo anguli ijs oppoſiti acuti per 9.

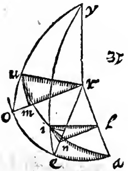
Denique, Si ut in tripleuro *eau*, baſis ſit quadrante major, crura *ea au* erunt affectionis diverſæ per 10. & ideo per 9, unus acutus, alter obtuſus, quod erat demonſtrandum.

XIII. Pro-

XIII. PROPOSITIO.

In tripleuro, ſinus laterum ſinibus oppoſitorum angulorum ſunt proportionales. 16 & 17 pr. lib. 4. Reg.

HVIVS veritas nobis in rectangulis demonſtrabitur, & inde ad obliquangula procedet.



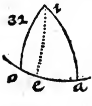
Sit igitur triangulum datum *aei*, cujus angulus ad *e* rectus, ad *a* autem acutus ſit primũ, & latera omnia quadrante minora; & *ei* crus perpendiculare ipſi *ea*, continuetur ad polum *y*. hinc ab eodem polo *y* quadrans in terminum quadrantis *ao* normalis demittatur; is quoque ad *aiu* erit normalis, quia *a* punctum polus eſt circuli *yo* per propoſitionem primam: Iam radii *ro ru* utriuſq; circuli & ipſius communes erunt ſectiones; & ſit *um* perpendicularis, ſinus peripheriæ *uo*, & ab *i* parallela *il* contra *ur*; & *iu* perpendicularis plano *aor*, erit parallela contra perpendicularem *um*. atque ideo planum *lin* plano *urm* parallelum. utriuſque communes ſectiones *rm ln* quoque inter ſe erunt parallelæ, & triangulum *urm* triangulo *iln* æquiangulum lateribus erit proportionale. Hoc eſt ut *ur* ad *um*, ita *il* ad *in*. Sed *ur* ſinus totus, eſt ſinus quadrantis, æqualis ſinui anguli recti ad *e*, *um* ſinus peripheriæ *uo*, ſeu anguli *a*, *il* ſinus baſis *ai*; *in* ſinus cruris *ei*: quare in triangulo rectangulo, ut ſinus recti *e* ad ſinum anguli *a*, ita ſinus

nus lateris *ai* recto oppoſiti, ad ſinum lateris *ei*, qui acuto opponitur.

Si triangulum aſſumatur, cujus angulus ad *i* ſit obtuſus, κατ' ἀναπλήρωσιν, res omnino erit eadem.

Si pro angulis *a* & *i*, per anapleroſin alteram, reſidua aſſumantur ad ſemicirculum, ut *ai* ſit latus commune, res iterum eadem erit, quia iidem ſinus manent qui prius.

In obliquangulis demonſtratio hinc derivabitur haud admodum difficulter: Sit enim triangulum



obliquangulum *eia*, & perpendicularis à vertice *io*. erit igitur per præmiſſa, ut ſinus anguli *o*, ad ſinum *e*, ita ſinus lateris *ei*, ad ſinum perpendicularis *io*; Et ut ſinus recti *o*, ad ſinum *a*; ita ſinus lateris *ai*, ad ſinum *oi*: rectangulum igitur è ſinu anguli *a*, & latere *ai*, æquatur rectangulo è ſinu *e* & latere *ei*; ergo latera reciproce erunt proportionalia, hoc eſt ut ſinus anguli *a* ad ſinum anguli *e*: ita ſinus lateris *ei* ad ſinum lateris *ai*, quod erat demonſtrandum. Sed de rectangulorum tripleurorum ſolutione prius dicendum eſt, quia iſta ad obliquangula viam nobis muniunt. Ex hac propoſitione dirivantur octo διδομένα, ſive data; & primo quidem.

XIV. PROPOSITIO.

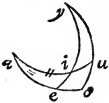
Rectangulorum ex hoc διδομένον I.

Data baſe recti, & angulo obliquo adiacente, crus eidem oppoſitum invenire.

I. FIAT *ut ſinus totus, ad ſinum baſis; ita ſinus anguli, ad ſinum cruris oppoſiti.*

Hujus

Huius veritas ex antecedentis propoſitionis demonſtratione, nullo circuitu manifeſta eſt. Ut enim ſinus anguli recti, qui eſt ipſe radius, ad ſinum anguli oppoſiti, ita latus recto oppoſitum ſive baſis, ad crus recti dato obliquo ſubtenſum: Et alternis igitur, ut propoſitum fuit; Sit igitur *ai* baſis 47 gr. 30 ſcr. & angulus *eai* 23 grad. 30 ſcr. & quæratur crus recti *ei*.



ut ſin. tot.	ad ſin. baſ.	ita ſin. anguli
	ai 47 gr. 30 ſcr.	*a* 23 gr. 30 ſcr.
10000000,	7372773,	3987491,

ad ſinum cruris *ei* 17 gr. 5 ſcr. 49 ſec. 2939886.

Hic modus prior eſt, ſecundus ſequitur.

II. *Vt ſinus totus, ad ſecantem complementi baſis; ita ſecans complementi anguli, ad ſecantem complementi lateris oppoſiti.*

Cum enim ſinus peripheriarum in antecedente ſchemate, *ai au*, *ei uo* ſint proportionales; erit quoque per prop. 19. libri primi ut ſinus *ai* ad ſinum *au* ſeu radium, ita radius, ad ſecantẽ complementi *ai*. Et ut ſinus *ei*, ad *uo*, ita per propoſ. 19. lib. primi ſecans complementi *uo* ad ſecantem complem. *ei*; Et ex æquo igitur, Radius eſt ad ſecantem compl. baſis *ai*; ut ſecans complementi *uo* (nam ſubtendit angulum ad *a*) ad ſecantem complementi cruris oppoſiti *ei*. Sunto eadem data quæ prius.

ut ſin. tot.	ad ſec. comp. baſ.	ita ſec. com. ang.
	ai 47 gr. 30 ſcr.	23 gr. 30 ſcr.
10000000,	13563417,	25078428,

ad ſec. com. cru *ei* 17 gr. 5 ſcr. 49 ſec. 34014988,

Vides hinc etiam eandem dari peripheriæ *ei* quantitatem quæ prius.

Sed & pluribus modis idem concludi poteſt; ſunt enim quatuor præterea modi, in quibus Radius ſive ſinus totus ſecundo ſit loco, quos hic obiter ſubjicio.

III. *Vt ſinus baſis, ad ſinum totum; ita ſecans complem. anguli, ad ſecantem complementi lateris oppoſiti.*

IV. *Vt ſecans complem. baſis, ad ſinum totum; ita ſinus anguli dati, ad ſinum lateris quæſiti.*

V. *Vt ſecans complem. anguli dati, ad ſinum totum; ita ſinus baſis, ad ſinum lateris oppoſiti.*

IV. *Vt ſinus anguli dati, ad ſinum totum; ita ſecans complem. baſis, ad ſecantem complem. lateris oppoſiti.*

Ita omnium rectangulorum triangulorum ſolutiones, ſex modis variari poſſunt; ſed reliquis quatuor inſuper habitis duos ubique tantum retinebimus, qui ſolo multiplicationis opere abſolvuuntur; & pluribus adhuc ſi ſinum totum nuſquam adhibere velis: ſed ea περιεργία eſt inutilis cum tangentium & ſecantium tabulæ illi fini ſint ſubductæ & in hos abacos illatæ.

XV. PROPOSITIO:

Δεδομένον II.

Dato crure recti & angulo oppoſito, datur baſis. Sed id definite conſtare debet, utrum baſis quadranti cedat an præſtet.

I. *VT ſinus totus, ad ſecantem complementi anguli; ita ſinus cruris dati, ad ſinum baſis.*

Nam ſinus peripheriarum *uo ua*, *ie ia* ſunt proportio-

portionales, ſed per propoſ. 18. libri primi ſinus *uo* eſt ad ſinum *ua* ſive radium, ut radius, ad ſecantem complementi, ipſius *uo*. In eodem exemplo.

ut ſin. tot.	ad ſec. com. ang.	ita ſin. cruris *ei*.
	a, 23 gr. 30 ſcr.	17 gr. 5 ſc. 49 ſe.
10000000,	25078428,	2939886,

ad ſinum baſis *ai* 47 gr. 30 ſcr. 7372772.

II. *Fiat, ut ſinus totus, ad ſinum anguli dati; ita ſecans complem. cruris, ad ſecantem complem. baſis.*

In eodem diagrammate per propoſ. 13. ſinus peripheriarum *au uo*, *ai ie* ſunt proportionales, ſed per propoſ. 19. lib. primi ut ſinus *ai*, ad *ie*, ita ſecans complementi *ie*, ad ſecantem complem. *ai*. Et ex æquo igitur ſinus *au*, ſive ſinus totus eſt ad ſinum *uo*, ſeu anguli *a*; ut ſecans compl. cruris oppoſiti *ie*, ad ſecantem compl. baſis *ai*.

Sunto data, crus *ei* 17 gr. 5 ſcr. 49 ſec. & angulus *iae* 23 gr. 30 ſcr. & quæratur baſis recti *ai*.

ut ſin. tot.	ad ſin. ang. *a*	ita ſec. comp. cruris
	23 gr. 30 ſcr.	*ei* 17 gr. 5 ſcr. 49 ſec.
10000000	3987491	34014837

ad ſec. comp. baſis *ai* 47 gr. 30 ſcr. 13563385.
atque ideo ipſa baſis erit 47 gr. 30 ſcr. abundante uno aut altero ſcr. ſecundo ob lubricitatem calculi.

XVI. PROPOSITIO:

Δεδομένον III.

Data baſe recti, & crure alterutro, datur angulus eidem oppoſitus.

I. FIAT *enim, ut ſinus totus, ad ſecantem compl. baſis; ita ſinus cruris, ad ſinum anguli oppoſiti.*

Sinus enim peripheriarum *ai au*, *ei uo* ſunt per propoſ. 13 proportionales. atqui per prop. 18 lib. primi ut ſinus *ai* ad ſinum *au*, ſive radium; ita radius quoque eſt ad ſecantem complementi baſis *ai*.

Sit igitur in eodem primo diagrammate *ai* baſis recti 47 gr. 30 ſcr. & crus 17 gr. 5 ſcr. 49 ſec. & quæratur angulus *a*

ut ſin. tot.	ad ſec. com. baſ. *ai*	ita ſin. crur. *ei*
	47 gr. 30 ſcr.	17 gr. 5 ſc. 49 ſe.
10000000	13563417	2939886

ad ſin. ang. *a* 23 gr. 30 ſcr. 3987490.

II. *Ut ſinus totus, ad ſinum baſis; Ita ſecans complementi cruris dati, ad ſecantem compl. anguli oppoſiti.*

Nam in eodem diagrammate ſinus *au ai*, *uo ei*. ſunt proportionales; ſed per prop. 19. lib. primi, ut hic *ou* ad ſinum *ei*, ita viciſſim ſecans compl. *ei* ad ſecantem compl. *ou*. Sit idem exemplum

ut ſin. tot.	ad ſin. baſ. *ai*	ita ſec. com. cr. *ei*
	47 gr. 30 ſcr.	17 gr. 5 ſcr. 49 ſec.
10000000	7372773.	34014837.

ad ſec. com. ang. opp. *a* 66 gr. 30 ſcr. 25078367. & ipſe angulus ideo 23 gr. 30 ſcr.

XVII. PROPOSITIO:

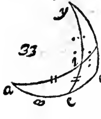
Δεδομένον IV.

Dato recti crure, & baſe, datur crus reliquum.

I. **F**IAT *enim, ut ſinus totus, ad ſecantem cruris dati; ita ſinus complementi baſis, ad ſinum complementi cruris reliqui.*

In ad-

In adjecto ſchemate dentur *ei* crus, & *ai* baſis recti ad *e*, ſitque *ou* menſura anguli *a*; & *y* polus circuli *ae*; Hic igitur triangulum *yiu* rectangulum, *aie* ad verticem eſt poſitum, & *yi ui* complementa *ai* & *ei*, atqui data baſe *yi* & crure *ui*, dabitur *eo* menſura anguli *y* per propoſitionem 16, cujus leges huc transfer & videbis omnia congruere: Ita enim illic eſt demonſtratum. Vt ſinus totus ad ſecantem compl. *yi*, ita ſinus cruris *iu*, ad ſinum *eo*, quæ menſura eſt anguli *y*. hoc eſt, ſi iſtas peripherias ad propoſitum triangulum *aei* referamus, ut ſinus totus, ad ſecantem cruris *ei*; ita ſinus complementi baſis *ai*, ad ſinum complementi cruris *ae*. Poſſet tota demonſtratio & ejus contextus huc transferri & applicari triangulo *yiu*, atque inde ad *aei*. Sed hoc eſſet cramben recoctam proponere; Hoc nunc ſemel indicare viſum: in ſequentibus tantum digitum ad fundum intendam. Sit baſis *ai* 47 grad. 30 ſcr. crus *ei* 17 grad. 5 ſcr. 49 ſec.



ut ſin. tot. ad ſec. crur. *ei* ita ſin. comp. baſ. *ai*
17 gr. 5 ſc. 49 ſec. 47 gr. 30 ſcr.
10000000 10462344 6755902
ad ſin. com. crur. *ae* 7068257, 44 gr. 58 ſcr. 38 ſec.

atque ideo ipſum crus datur 45 gr. 1 ſcr. 22 ſec.

II. *Vt ſinus totus, ad ſinum complementi cruris; ita ſecans baſis, ad ſecantem cruris reliqui.*

Id enim planum eſt è ſecunda antecedentis propoſitionis analogia, ſi oculos ad propoſitum diagramma & triangulum *yiu*, dato *aie*

verticale referas. Sit idem exemplum propoſitum, *ai* baſis 47 gr. 30 ſcr. & crus *ei* 17 grad. 5 ſcr. 49 ſec.

ut ſin. tot.	ad ſin. com. cru. *ei* 17 gr. 5 ſcr. 49 ſec.	ita ſec. baſ. *ai* 47 gr. 30 ſcr.
10000000	9558086	14801872

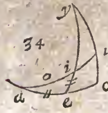
ad ſec. crur. *ae* 45 gr. 1 ſcr. 22 ſec. 14147756.

XVIII. Propositio:

Διδόμενον V.

Dato utroque crure recti, datur & baſis.

I. Fiat *enim, ut ſinus totus ad ſinum complementi cruris unius, ita ſinus complem. cruris alterius, ad ſinum complem. baſis.*



Ut in appoſito diagrammate datis cruribus *ae* & *ei* quæritur baſis *oi*. & hoc per triangulum rectangulum ad verticem ei poſitum ſolvetur: complementum enim cruris *ae* eſt *eo* menſura anguli *y*, complementum *ei* eſt *iy*, at per prop. 13. ut radius, vel ſinus totus, ad ſinum *iy*, ita ſinus *eo*, ad ſinum *iu*. & hæc ſunt complementa laterum *ae ei* quemadmodum propoſuimus.

ut ſin. tot.	ad ſin. com. cr. *ei* 17 gr. 5 ſcr. 49 ſec.	ita ſin. com. cr. *ae* 45 gr. 1 ſcr. 22 ſec.
10000000,	9558086,	7068256,

ad ſin. com. baſ. *ai* 42 gr. 30 ſcr. 6755900.
atque ideo ipſa baſis *ai* erit 47 gr. 30 ſcr.

II. *Ut ſinus totus, ad ſecantem cruris, ita ſecans cruris reliqui, ad ſecantem baſis.*

Hoc

Hoc ex priori parte conſequitur. vel potius è modo ſecundo propoſ. 14. ut primum hoc ex illo primo derivari, poteſt. res animum advertenti non eſt obſcura.

Vt ſin. tot.	ad ſec. cr. *ei*	ita ſec. cr. *ac*
	17 gr. 5 ſcr. 49 ſec.	45 gr. 1 ſcr. 22. ſec.
10000000	10462344	14147760

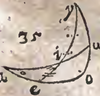
ad ſec. baſ. *ae*, 47 gr. 30 ſcr. 14801913.

XIX. PROPOSITIO:

Δεδομένον VI.

Dato crure recti & angulo adiacente, dabitur obliquus eidem oppoſitus.

I. FIAT *enim, Vt ſinus totus, ad ſinum anguli dati, ita ſinus complementi cruris dati, ad ſinum complementi anguli oppoſiti.*



In propoſito ſchemate datur crus *ei*, cum angulo ad *i*, & quæritur angulus obliquus *a*. & hoc quoque per triangulum rectangulum ei ad verticem poſitum ſolvetur: nam hic *iy* complementum eſt cruris *ei* & angulus *yiu* dato verticalis, & ideo æqualis. Itaque in triangulo *iyu*, data baſi *yi*, & angulo *i*, inveniatur latus oppoſitum *uy*, cujus complementum eſt *uo*, menſura anguli ad *a*. atque ita hujus veritas ex prima parte propoſ. 14. manifeſta erit.

Detur itaque, crus *ei* 17 gr. 5 ſcr. 49 ſec. & angulus *i* 73 gr. 37 ſcr. 47 ſec.

ut ſin. tot. ad ſin. ang. *i.* ita ſin. com. crur. *ei*
73 gr. 37 ſcr. 47 ſec. 17 gr. 5 ſcr. 49 ſec.
10000000 9594600 1958086
ad ſin. com. ang. *a*, 66 gr. 30 ſcr. 9170601,
& ideo ipſe ang. *a* 23 gr. 30 ſcr.

II. *Ut ſinus totus, ad ſecantem compl. anguli dati; ita ſecans cruris dati, ad ſecantem anguli oppoſiti.*

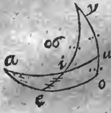
Hujus veritas ex ſecunda parte propoſ. 14. ſecundum appoſitum diagramma aſſumi potuit, quemadmodum hanc primam ex illa prima demonſtravimus; ſed poteſt illa ex hac prima parte quoque derivari; inſpice quæ illic diximus.
ut ſin. tot. ad ſec. comp. ang. *i* ita ſecans cr. *ei*
73 gr. 37 ſcr. 47 ſec. 17 gr. 5 ſc. 49 ſe.
10000000 10422525 10462343
ad ſec. ang. *a* 23 gr. 30 ſcr. 10904403.

XX. PROPOSITIO:

Δεδομένον VII.

Dato crure & angulo oppoſito, datur obliquus adiacens; oportet autem definiri utrum recto cedat an præſtet.

I. FIAT enim, *Ut ſinus totus, ad ſecantem cruris, ita ſinus complem. anguli oppoſiti, ad ſinum anguli adjacentis.*



In adjecto ſchemate datur crus *ei*, cum angulo oppoſito *a*, quæritur reliquus obliquus ad *i*. hoc quoque per triangulum ad verticem *iyu* & enallagen pleurogonicen ſolvetur; nam anguli *a* menſura eſt

ra eſt *ou*, & complementum cruris *ei* eſt *uy* baſis recti; quare in triangulo *iuy* per propoſ. 16 partem primam data baſe *yi* & crure *uy* recti dabitur angulus eidem oppoſitus ad *i*. eſt enim illic, ut ſinus totus, ad ſecantem compl. baſis *yi*, ita ſinus cruris *uy*, ad ſinum anguli *i*. ſed baſis complementum eſt *ei*, & complementum cruris *uy* eſt *uo*, menſura anguli ad *a*. ſit angulus ad *a*, 23 gr. 30 ſcr. crus *ei* 17 gr. 5 ſcr. 49 ſec.

ut ſin. tot.	ad ſec. cr. *ei*	ita ſin. com. ang. *a*
	17 gr. 5 ſcr. 49 ſec.	23 gr. 30 ſcr.
10000000	10462344	9170601

ad ſin. ang. *i* 73 gr. 37 ſcr. 47 ſec. 9594598.

II. *Ut ſinus totus, ad ſinum complementi cruris dati, ita ſecans anguli oppoſiti, ad ſecantem complem. anguli reliqui.*

Eadem ratione quâ prior modus è priore decimæſextæ propoſitionis derivatur, ita hic poſterior ex illius ſecundo quoque derivabitur. Sit ergo crus *ei* 45 gr. 1 ſcr. 22 ſec. & angulus ei oppoſitus *a* 73 gr. 37 ſcr. 47 ſec.

ſin. totus	ſin. com. cr. *ei*,	ſec. ang. *a*.
	45 gr. 1 ſcr. 22 ſec.	73 gr. 37 ſc. 47 ſec.
10000000	7068256	35480654

ſec. com. ang. *i* 66 gr. 30 ſcr. 25078634.

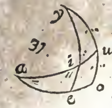
XXI. PROPOSITIO:

Διδομένον VIII.

Dato utroque angulo obliquo, datur crus recti utrumlibet.

I. FIAT *enim, ut ſinus totus, ad ſecantem complem. anguli unius; ita ſinus complem. reliqui, ad ſinum complem. cruris huic oppoſiti.*

Id ex antecedente 22 derivabitur hoc modo, cum enim in triangulo *aei* dentur anguli *a* & *i*; in triangulo igitur illi ad verticem oppoſito *uiy*, ex angulo *a* datur ejus quantitas *ou*, & propterea ipſa peripheria *uy*. quare in triangulo *uyi*, datur crus recti *uy*, cum angulo *i* ipſi oppoſito; inde jam quæratur angulus *y*, ſeu peripheria *eo*, cujus compl. eſt *ae* crus anguli dati *a*. Sit igitur angulus *a* 23 gr. 30 ſcr. & *i* 73 gr. 37 ſcr. 47 ſec. itaque ſi leges propoſitionis antecedentis huc transferas, erit ut



ſinus totus	ad ſec. com. ang. *a*	ita ſin. com. ang. *i*,
	23 gr. 30 ſcr.	73 gr. 37 ſcr. 47 ſec.
10000000,	25078428	2818437

ad ſin. com. cr. *ae*. 44 gr. 58 ſcr. 38 ſec. 7068197, cujus complementum 45 gr. 1 ſcr. 22 ſec. pro crure *ae*. non tamen exactè, nam deberent eſſe 24 ſec. ex calculo.

II. *Vt ſinus totus, ad ſinum anguli unius; ita ſecans anguli alterius, ad ſecantem lateris huic oppoſiti.*

Id quoque eodem modo ex ſecunda antecedentis propoſitionis factione derivatur; confer hoc diagramma cum iſtius præceptis, quemadmodum antea eſt à nobis factitatum, omnia reſpondebunt. ſunto data eadem quæ prius.

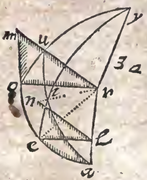
ſin. totus	ſin. ang. *a*.	ſec. ang. *i*
	23 gr. 30 ſcr.	73 gr. 37 ſcr. 47 ſec.
10000000,	3987491,	35480654,

ſec. cr. *ae* 45 gr. 1 ſcr. 22 ſec. 14147878.
crus igitur recti *ae* oppoſitum angulo *i* erit 45 gr. 1 ſcr. 22 ſec. paulo majus ob lubricitatem calculi.

XXII. PRO-

XXII. PROPOSITIO.

In tripleuro ſphærico rectangulo, eſt ut ſinus totus ad ſinum cruris recti, ita tangens anguli obliqui adjacentis, ad tangentem cruris eidem oppoſiti.



SIT enim tripleurum *aei*, cujus angulus ad *e* rectus, reliqui obliqui; & latera *ae ai* continuentur ad ſuos quadrantes *o u*, deinde ex *a* angulo decircinetur menſura ejus *ou*, quæ continuata occurret cruri *ei* in *y*, polo circuli *oea*, per conſ.prop.3. Inde peripheriæ *ou* tangens ſit *om*, quam terminet ſecans *rum*: porrò perpendiculari *en*, occurrat recta ex centro *rin*; ea tangentem peripheriæ *ei* definiet; & ambæ lineæ *mr nr* jacebunt in plano circuli *ura* continuato: in eodem igitur plano ſit *nl* parallela contra *mr*, planum igitur trianguli *enl* plano *omr* parallelum, & ſectum à plano circuli *ora*, dabit per 16. p. 11 l. Eucl. communes ſectiones *or el* quoque parallelas; & ideo anguli triangulorum *omr enl* æquales per 10 pr.l.11.Eucl. & ipſa triangula ideo erunt ſimilia: hoc eſt ut *or* ſinus totus, ad *el* ſinum cruris *ea*; ita tangens *mo*, peripheriæ *ou*, quæ menſurat angulum *a*, ad *en* tangentem cruris *ei*; Quod erat demonſtrandum. Ex hoc theoremate ut è 13 prop. itidem octo δεδομένα derivantur. Et primo quidem,

XXIII. PRO-

XXIII. PROPOSITIO:

Ex hoc Δεδομένον IX.

Dato crure recti & angulo adjacente, datur crus reliquum.

ID ſtatim ex ipſa demonſtratione aſſumi potuit:

I. *Fiat enim, ut ſinus totus, ad ſinum cruris dati, ita tangens anguli adjacentis, ad tangentem cruris reliqui.*

Datum triangulum ſit *aei*, erit igitur, ut *or* ad *el*, ita *mo* ad *ne*.

Sit *ae* 45 gr. 1 ſcr. 22 ſec. & angulus adjacens *a* 23 gr. 30 ſcr.

ut ſin. tot.	ad ſin. cr. *ea*	ita tang. ang. *a*
	45 gr. 1 ſcr. 22 ſec.	23 gr. 30 ſcr.
10000000	7073878	4348124

ad tang. cr. *ei* 17 gr. 5 ſc. 49 ſec. 3075809,

II. *Vt ſinus totus, ad ſecantem complem. cruris dati, ita tangens compl. anguli, ad tangentem compl. cruris oppoſiti.*

Nam ex demonſtratis. ut ſinus peripheriæ *ae*, ad ſinum totum *or*, ita tangens *ei*, ad tangentem *ou*. atqui per prop. 18 lib. primi, ut ſinus *ae*, ad radium, ita radius ad ſecantem complementi peripheriæ *ae*, Et per prop. 15 lib. primi ut tangens *ei*, ad tangentem *ou*, ita tangens compl. *ou*, ad tangentem compl. *ei*; ex æquo igitur,

ut ſin. tot.	ad ſec. com. cr. *ae*	ita tang. com. an. *a*
	45 gr. 1 ſcr. 22 ſec.	23 gr. 30 ſcr.
10000000	14136518	22998425

ad tan. com. cr. *ei* 72 gr. 54 ſcr. 11 ſec. 32511764,

Ergo ipſum crus *ei* eſt 17 gr. 5 ſcr. 49 ſec.

XXIV. PRO-

XXIV. PROPOSITIO:

Λεδομένον X.

Datis recti cruribus, datur angulus obliquus uterque.

I. FIAT *enim, ut ſinus totus, ad ſinum cruris unius; ita tangens complementi cruris reliqui, ad tangentem compl. anguli huic oppoſiti.*

Cum enim ſit, ut ſinus totus *or*, ad ſinum *el*, ita tangens peripheriæ *ou*, ad tangentem peripheriæ *ei*. per propoſ. 15 lib. primi, ita quoque eſt viciſſim tangens complementi *ei*, ad tangentem complementi *ou*. quare

ut ſin.tot.	ad ſin.cr.*ea*	ita tang.com.cr.*ei*
	44 gr.1 ſc.22 ſec.	17 gr.5 ſcr.49 ſec.
10000000	7073878	32511676

ad tan. com. ang.*a*. 23 gr.30 ſcr. 22998363.

II. *Vt ſinus totus, ad ſecantem compl. cruris unius; ita tangens cruris reliqui, ad tangentem anguli ſibi oppoſiti.*

Cum enim per propoſitionem 22. ſit ut ſinus *ea*, ad ſinum totum, ita tangens peripheriæ *ei*, ad tangentem *ou*, ſive anguli *a*: Erit quoque per propoſ. 18 lib. primi ut ſinus totus, ad ſecantem compl.*ea*, ita tangens *ei* ad tangentem *ou*.

ut ſin. tot.	ad ſec.com.cr.*ea*.	ita tang.cr.*ei*
	45 gr.1 ſc.22 ſe.	17 gr.5 ſc.49 ſec.
10000000	14136518	3075819

ad tang.ang.*a* 23 grad.30 ſcr. 4348137.

XXV. PRO-

XXV. PROPOSITIO:

Δεδομένων XI.

Dato crure recti & angulo oppoſito, datur crus reliquum. Oportet autem definiri utrum quadranti cedat an præſtet.

I. FIAT enim, *Ut ſinus totus, ad tangentem compl. anguli dati, ita tangens lateris oppoſiti, ad ſinum cruris adjacentis.*

Cum enim ſit in eodem diagrammate, tangens peripheriæ *ou* ad ſinum totum, ut tangens peripheriæ *ei* ad ſinum *ea*. Et ſit quoque per propoſ. 14. lib. primi ut tangens *ou* ad ſinum totum, ita ſinus totus ad tangentem complementi ejus. Erit quoque, Ut ſinus totus, ad tangentem complementi anguli dati, ita tangens lateris oppoſiti, ad ſinum cruris adjacentis:

Sit igitur *ea* 45 gr. 1 ſcr. 22 ſec. & angulus *i* 73 gr. 37 ſcr. 47 ſec.

ut ſin. tot.	ad tan: com. an. *i*	ita tang. lat. *ae*
	73 gr. 37 ſc. 47 ſe.	45 gr. 1 ſc. 22 ſec.
10000000	2937524	10007953

ad ſinum cr. *ei*. 17 gr. 5 ſcr. 49 ſe. 29398602.

II. *Ut ſinus totus, ad tangentem anguli dati; ita tangens compl. cruris oppoſiti, ad ſecantem compl. cruris adjacentis.*

In eodem enim triangulo eſt, ut ſinus totus, ad tangentem peripheriæ *ou*; ita ſinus peripheriæ *ae*, ad tangentem *ei*; ſed ita quoque eſt per propoſ. 20. lib. primi, tangens compl. *ae* ad ſecantem compl. *ei*. Erit igitur

ut ſin.

ut ſin. tot.	ad tang. an. *i*	ita tan. com. cr. *ae*.
	73 gr. 37 ſcr. 47 ſec.	45 gr. 1 ſc. 22 ſec.
10000000	54042258	9992049

ad ſec. com. cr. *ei* 34015191.

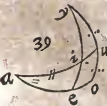
Cum debetur peripheria 72 grad. 54 ſcr. 11 ſec. ejus itaque complementum 17 gr. 5 ſcr. 49 ſec. erit ipſum crus *ei*.

XXVI. PROPOSITIO:

Δεδομένον XII.

Data recti baſe, & angulo obliquo, datur crus eidem adiacens.

I. FIAT *enim, Vt ſinus totus, ad ſinum complementi anguli dati; Ita tangens baſis, ad tangentem cruris angulo dato adjacentis.*



Sint in triangulo *aei*, data baſis *ai* & angulus, & compleatur diagramma ad quadrantem ut prius. ex angulo *a* datur peripheria *uo*, & complementum *uy*, & ex *ai* datur *iu*. itaque datis cruribus *yu ui*, datur per propoſ. 24 ang. *y*, menſura *eo*, cujus complementum crus *ae*: repete demonſtrationem & huc applica ſi libet. Sit igitur

ut ſin. tot.	ad ſin. com. an. *a*.	ita tang. baſ. *ai*,
	23 gr. 30 ſcr.	47 gr. 30 ſcr.
10000000	9170601	10913085

ad tan. cr. *ae* 45 gr. 1 ſcr. 22 ſec. 10007955.

II. *Vt ſinus totus, ad ſecantem anguli; ita tangens compl. baſis, ad tangentem compl. cruris adiacentis.*

Veritas

Veritas è ſecunda parte 24 propoſitionis manifeſta eſt per triangulum ad verticem poſitum *uiy*, ut prius. Ergo

ut ſin. tot.	ad ſec. ang. *a*,	ita tan. com. baſ. *ai*,
	23 gr. 30 ſcr.	47 gr. 30 ſcr.
10000000	10904411	9163312

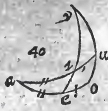
ad tang. com. cr. *ae*, 44 gr. 1 ſcr. 22 ſec. 9992052.

XXVII. PROPOSITIO:

Δεδομένον XIII.

Data baſe & crure, datur angulus ab iis comprehenſus.

I. FIAT *enim, Ut ſinus totus, ad tangentem cruris; ita tangens compl. baſis, ad ſinum complementi anguli ab iis comprehenſi.*



Sit datum triangulum *aei*, & in eo baſis *ai* & crus *ae*, ergo per commutationem, datur in triangulo ad verticem *yiu*, crus *ui*, cum *eo* peripheria, quæ eſt anguli menſura ad *y*. ergo per 25 prop. 1 modum datur crus *uy*, cujus compl. *uo* eſt menſura anguli quæſiti *a*. Licebit ſi voles totam demonſtrationem huc quaſi à principio transferre. Sit itaque baſis recti *ai* 47 gr. 30 ſcr. & crus *ae*. 45 gr. 1 ſcr. 22 ſec.

ut ſin. tot.	ad tang. cr. *ae*,	ita tang. com. baſ. *ai*,
	45 gr. 1 ſcr. 22 ſec.	47 gr. 30 ſcr.
10000000	10007955	9163312

ad ſin. com. ang. *a*, 9170601, cui debentur 66 gr. 30 ſcr. hujus igitur complementum 23 grad. 30 ſcr. erit menſura anguli *a*, ab ipſis comprehenſi.

II. *Ut*

II. *Ut ſinus totus, ad tangentem compl. cruris dati; ita tangens baſis, ad ſecantem anguli ab ijs comprehenſi.*

Veritas ex appoſito diagrammate, per 25 propoſ. modum ſecundum eſt manifeſta, ſi in triangulo *iuy*, crura *iu uy* complementa laterum datorum in *aei* triangulo aſſumas. Ergo

ut ſin. tot.	ad tang.com.cr. *ae*	ita tang. baſ. *ai*
	45 gr. 1 ſcr. 22 ſec.	47 gr. 30 ſcr.
10000000	9992053	10913085

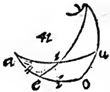
ad ſec.ang. *a* 23 gr. 30 ſcr. 10904411.

XXVIII. PROPOSITIO:

Διορισμὸν XIV.

Dato crure & angulo adjacente, datur baſis.

I. FIAT *enim, ut ſinus totus, ad ſinum complementi anguli, ita tangens complem. cruris dati, ad tangentem compl. baſis.*



Sit enim datum triangulum hic *aei*, & angulus *a* cum crure adjacente *ei*, & quæratur baſis *ai*. Vides itaque in triangulo verticali ex his datis dari angulum *y* & crus *uy*, atque inde dari per propoſ. 25 modum primum crus *ui* complementum baſis *ai*. ut hic expreſſimus. Sit igitur crus *ae* 45 grad. 1 ſcr. 22 ſec. & angulus *a* 23 gr. 30 ſcr.

ut ſin. tot.	ad ſin. com. ang. *a*	ita tan. com. cr. *ae*
	23 gr. 30 ſcr.	45 gr. 1 ſcr. 22 ſec.
10000000	9170601	9992053

ad tang, com. baſ. *ai* 47 gr. 30 ſcr. 9163312.

II. *Vt ſinus totus, ad ſecantem anguli dati, ita tangens cruris, ad tangentem baſis.*

Res in eodem diagrammate ex triangulo *yui* per ſecundum 25 propoſ. modum manifeſta eſt.

ut ſin. tot.	ad ſec. ang. *a*	ita tang. cr. *ae*
	23 gr. 30 ſcr.	45 gr. 1 ſcr. 22 ſec.
10000000	10904411	10007953

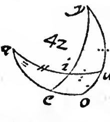
ad tang. baſ. *ai*. 47 gr. 30 ſcr. 10913083.

XXIX. PROPOSITIO:

Δεδομένων XV.

Data baſe & obliquo alterutro, datur reliquus angulus obliquus.

I. FIAT *enim, ut ſinus totus ad ſinum complementi baſis; ita tangens anguli dati, ad tangentem complementi obliqui reliqui.*



Sit propoſitum triangulum *aei*, & in eo data baſis *ai*; & angulus *a*; & quæratur angulus *i*. ex datis igitur in triangulo verticali *iuy*, dabuntur quoque crura recti *iu uy*, atque hinc per 24 propoſ. modum primum dabitur angulus *yiu*, cui *ai* ad verticem æquatur. Sit enim *ai* baſis 47 grad. 30 ſcr. & angulus *a* 73 gr. 37 ſcr. 47 ſec.

ut ſin. tot.	ad ſin. com. baſ. *ai*;	ita tang. ang. *a*
	47 gr. 30 ſcr.	73 gr. 37 ſc. 47 ſe.
10000000	6755902	34042258

ad tang. com. ang. *i* 22998425.

Cui cedunt 66 gr. 30 ſc. ejus complem. 23 gr. 30 ſcr. eſt menſura anguli ad *i* reliqui.

II. *Vt*

II. *Vt ſinus totus, ad ſecantem baſis, ita tangens complementi anguli dati, ad tangentem obliqui reliqui.*

Hoc ex ſuperiore facile conſtat adhibita propoſ. 22 & 18 libri primi; vel etiam ex ſecundo modo propoſitionis 24 aſſumi poterit, per triangulum *yui*. Ergo

ut ſin. tot.	ad ſec. baſ.	ita tang. com. ang. *a*,
	47 gr. 30 ſcr.	37 gr. 37 ſcr. 47 ſec.
10000000,	14801872,	2937550,

ad tan. com. ang. *i*, 22998616.

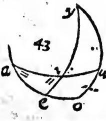
Cui cedit peripheria 66 gr. 30 ſcr. ejus autem complem. 23 gr. 30 ſcr. eſt menſura anguli reliqui ad *i*.

XXX. PROPOSITIO:

Δεδομένον XVI.

Dato utroque angulo obliquo, datur baſis.

I. FIAT *enim, ut ſinus totus, ad tangentem complementi anguli unius; ita tangens complem. obliqui reliqui, ad ſinum compl. baſis.*



Sunto in propoſito tripleuro *aei*, anguli *a* & *i* dati, & quæratur baſis *ai*. Dantur itaque ex his datis in triangulo ad verticem poſito *yui*, crus *uy* & angulus obliquus *i* eidem oppoſitus, ergo per 25 propoſ. modum primum, datur crus reliquum *ui*, ſive complementum baſis quæſitæ *ai*. ſi libet in triangulo *yui* illam demonſtrationem deducas; ſit nunc angulus *a* 23 gr. 30 ſcr. & *i* 73 gr. 37 ſc. 47 ſec. Erit itaque

ut ſin. tot. ad tan.com.ang.*i*, ita tan.com.ang.*a*,
73 gr.37 ſcr.47 ſec. 23 gr.30 ſcr.
10000000 2937564 22998425
ad ſin. com. baſis *ai*, 6755933.
Cui debetur peripheria 42 gr. 30 ſcr. ejus complementum 47 gr,30 ſcr. pro ipſa baſi.

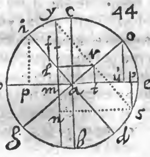
II. *Vt ſinus totus, ad tangentem anguli unius, ita tangens anguli alterius, ad ſecantem baſis.*

Hujus demonſtrationem ex antecedente derivare poteris per propoſ. 14 & 19. lib. primi. aut ex ſecundo modo propoſitionis 25 aſſumere, per data trianguli verticalis *iuy*. Ergo
ut ſin. tot. ad tang. ang.*i*, ita tang. ang.*a*
73 gr.37 ſcr.47 ſec. 23 gr.30 ſcr.
10000000 34042258 4348124
ad ſec.baſ.*ai*, 47 gr.30 ſcr. 14801996.

Sed & prochiron hoc non eſt negligendum, cum primo loco erit ſinus totus, ſecundo autem & tertio ſinus: Nam

XXI. Propositio.

Si peripheria prima ſecundæ complem. addatur, & ab eodem ſubducatur; horum ſinuum differentia erit dupla quarti praportionalis, ſi prima peripheria ſit minor complemento ſecundæ; aut ſumma, ſi maior.



Sint igitur normales diametri *og id*, *cb*, *ve*, & peripheriæ datæ *oc os*, ſeu *oy*, quæ major eſt quam *oe* complementum ipſius *oc*; itaque prima *yo* plus *oe* conflabit peripheriam *ye*, ejus ſinus *ym*; *oy* ſeu *os* minus *oe* relinquet peripheriam *es*, ejus

ejus ſinus *sp*, cui æqualis ſit *mn*; & *ns* ideo contra diametrum *me* parallela; & ab *r* ſit perpendicularis *rt* in radium *ae*, & *rl* in ſinum *ym*; cum itaque *rl sn* eidem *yn* perpendiculares, ſint parallelæ, & inſcripta *ys* biſecetur in *r*, etiam *yn* biſecabitur in *l*; atque ideo recta *yl* dimidia erit compoſitæ ex ſinu *ym* & *mn*. porrò ob ſimilitudinem triangulorum *ryl aip* (nam *ys id* ſunt parallelæ) erit ut *ai* radius, ad *ip* ſinum *vi* ſeu *oc* (nam *ic* eſt complementum commune) ita *ry*, ſinus *oy*, ad eandem *yl*. quod erat membrum prius.

Secundum liquet quoque in eodem diagrammate; ſunt enim *oe* & *ds* ſeu *yi* datæ peripheriæ, & *oe* minor quam *os* complementum ipſius *ds*, erit igitur ut *ao* radius ad *ou* ſinum ipſius *oe*; ita *ar* ſinus *yi*, ad *rt*. Sed eadem *rt* æquatur ipſi *lm*; & cum *yf* ſit ipſi *mn* æqualis, *lm* ſeu *rt* erit æqualis dimidiæ differentiæ inter *ym*, quæ eſt ſinus compoſitæ ex *oe* prima, & *os* ſeu *oy* complemento ſecundæ; & *es* ex ſinu differentiæ earundem; quod erat demonſtrandum.

Quod ſi prima ſit æqualis complemento ſecundæ, aſſumatur alterutrius peripheriæ duplæ ſinus, ejus dimidium erit quarta proportionalis. id enim poſito diagrammate facile liquebit.

Eſto *vi* vel *oc* 71 grad. *oy* vel *os* 45. erit ergo

ut *ai* rad.	ad *ip* ſin. 71 gr.	ita *yr* ſin. 45.	ad
10000000	9455186	7071068	6685826

eundem numerum per proſtaphæreſin invenies hoc pacto,

	oc	71 grad.
	oy	45
Compl.	*oe*	19

Summa *ye* 64 ſin. 8987940
differ. *se* 26 ſin. 4383711

 quia

quia *oc* major eſt quam *eo* complementum ipſius *oy*,
addantur 13371651
dimidium erit 6685825, ſinus idem qui ſupra; cui cedunt 41 gr. 57 ſcr. 28 ſec.

In eodem diagrammate dabitur opus ſubductionis:

Sit enim peripheria *oe* 19. gr. *ds* 45 gr. ergo proſtaphæreticè.

	oe	19.
	ds	45.
Compl.	*os*	71.

Summa 116. 8987940 ſinus.
Differ. 26. 4383711
quia *ds* minor eſt quam *os* ſubd. 4604229
ejus ſemiſſis 2302114, erit quartus proportionalis; quem invenies, ſi ita inſtituas, ut 10000000 ad ſinum 45 grad. 7071068, ita ſinus 19 gr. 3255681, ad 2302114 nempe ut ante cui debentur 13 gr. 18 ſcr. 34 ſec.

Si vero minor ſit majoris complementum, ſumatur ſemiſſis ſinus duplæ alterutrius peripheriç: ut in exemplo,

Datæ peripheriæ ſunto
59 gr.
31 gr. hujus duplum
62 gr. ſinus 8829476
dimid. 4414738 quartus proportionalis.

2. At ſi in altero tantum loco, vel etiam neutro, ſinus puri interveniant, poterit tamen nihilo minus calculus proſtaphæreſi ſpuria, & fictis ſinibus abſolvi. Exemplum ſit è propoſ. 29 ubi data baſe & angulo obliquo reliquus quæritur.

Sitque baſis *ay* 47 gr. 30 ſcr. & angulus *a* 73 grad. 37 ſcr. 47 ſec. Erit itaque

ut ſin.

ut ſin. tot.	ad ſin.com.*ai* 47 gr.30 ſcr.	ita tang. ang.*a* 73 gr.37 ſcr.47 ſec.
10000000	6755902	34042280

ad tang. comp.ang. *i*.

Hic tangens 34042280 pro ſinu eſt habenda, & videndum quæ peripheria in ſinibus ei reſpondeat; & quia ſuperat ſinum maximum, ultima nota erit diſſimulanda, tanquã ſi darentur tantum 3404228 cui cedit peripheria 19 gr. 54 ſcr. 9 ſec. Atque hinc jam locus erit proſtaphæreſi, hoc modo

	gr.	ſcr.	ſec.		
compl.	42	30			
	19	54	9		
	47	30	0		
	67.	24.	9.	9232269	ſin.
	27.	35.	51.	4632575	ſin.
				4599694	
				2299847	dimid.

Ergo factus per radium diviſus eſſet 2299847, ſed cum unam notam ſupra è tangente detriverimus, ea nunc eſt adjicienda, ut nempe ſit 22998470 pro tangente complem. anguli *i*, cui cedit peripheria 86 grad. 30 ſcr. ipſeque adeo angulus quæſitus erit 23 gr. 30 ſcr. Qui magno canone operis Palatini uti volet, qui ad dena ſecunda ad radium decem notarum eſt ſubductus; cuique ad dena ſecunda tantum calculum inſtituere ſatis ſit, illi hæc numeratio facile fluet, neque quidquam habebit remoræ.

3. Si neutro loco ſinus interveniat, uterque numerus pro ſinu erit habendus, & ipſis ſuæ peripheriæ aſſignandæ, atque inde reliqua ut ſupra.

4. Et rurſum ſi radius non ſit loco primo, ſed ſecundo aut tertio: nam per propoſ. 18 lib. 1. ſinus eſt

ad radium, ut radius ad ſecantem complementi, quamobrem ſi proponatur

ut ſinus ad ſinum totum, ita ſinus
40 gr. 30 ſcr. 10000000, 73 gr. 45 ſcr. ad quem?
Erit quoque ideo
ut ſin. totus ad ſecant. compl. ita ſinus
10000000 40 gr. 30 ſcr. 73 gr. 45 ſcr. ad quartum.

Atque ita tibi opus antecedens factionis ſecundæ redit, ut per ſolam proſtaphæreſin ad eam rem via ſit expedita.

Denique ſi nullo loco ſinus totus detur, proſtaphæreſis tamen neque hic te deſtituet: poteſt enim ea proportio in duas reſolvi ut radius interveniat; quemadmodum ſi proponatur

ut tang. ad tang. ita ſecans
60 gr. 49 gr. 40 gr.
17320508, 11503684. 13054073
Hæc ita diſpunges, ad quem?
ut tang. ad tang. ita
60 gr. 49 gr. 10000000, ad quartum
Et ut ſin. tot. ad inventum, ita ſecans
10000000 40 gr.
13054073 ad quæſitum;

vides hic quartum in prima proportione per proſtaphæreſin inveniri ex modo tertio, & rurſum quartum & quæſitum terminum ex modo ſecundo: ipſe ſi libet opus perſequitor, ſi tibi ea res tanti videatur, mihi indicaviſſe ſatis eſt, ut eo modo utatur qui volet.

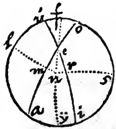
Proſtaphæreſin puram quis primus invenerit ſententiæ variant, & quiſque eum ferè pro autore habet, à quo primum eam hauſit: Ego plane ita judico, eum primum eam repperiſſe, qui nobis analemma deſignavit, unde per ſinus ex data hora ſolis altitudo

altitudo ſubducitur. Atqui inquies id jam antiquum commentum eſt, neque hoc demum ſeculo proditum, rectè inquam. At hoc volebam, qui hoc ſeculo nobis tabulam ſinuum ad radium millenarium, nempe 10000000 ſubduxit; atque is Regiomontanus fuit, ut opinor: quamobrem iſte quoque in illos analemmatum abacos hanc proſtaphæreſin intuliſſe cenſendus eſt: at forſan non ubique ubi ſinus eſſent ſecundo & tertio loco; fateor quidem id verum eſſe poſſe, at facile iſtinc fuit iſta derivare, & à tam nobili exemplo ad alia eam analogiam tranſferre: ego interim nemini præjudicatum velim; certe cum nemo ſe ejus autorem profiteatur, ego quod vero-ſimillimum eſt ſequi malui, cum eadem omnino via & demonſtratio in analemmate extet, quando ex data ſolis declinatione ſinus horæ ſextæ quæritur.

Porrò obliquangula tripleura ſphærica reductione ad rectangula ſolvi poſſunt, & poſſunt quoque abſque ea: ſed ut rectangulorum uſus ſit illuſtrior, eam reductionem primo loco expendemus, & alteram ſolutionem libro ſequenti: nam uterque modus ſuo loco adhibitus non tantum ſummam delectationem, ſed utilitatem quoque habet oportunam.

XXXII. PROPOSITIO.

Si tripleuri anguli ad baſin obliqui, fuerint affectionis eiuſdem, perpendicularis à vertice cadet etiam intra. at extra tantum ſi diverſa.



Sit *aei* tripleurum, cujus anguli ad baſin *ai* ambo ſint obtuſi, ajo perpendicularem à vertice *e* ductam baſin *ai* interſecare: continuetur enim baſis *ai* in circulum *aisu*, cujus ipſa eſt pars; ſitque hujus circuli polus *n*; is intra crura *ae ei* ſitus erit: nam ſi intervallo *in* deſcribatur peripheria *ns*, hæc quadranti æqualis erit; atqui angulus *eis* eſt acutus, & *rs* menſura ejus, per conſect. 1 propoſ. 6. erit itaque iſta *rs* quadrante minor, & *ns* ideo hac major; idem parte altera de angulo *eau* judicium eſto: nam *lm* minor eſt quadrante *ln*. Quamobrem perpendicularis ab *e*, per *n* polum educta cadet inter crura *ea ei*. Haud alia ratio eſt in triangulo *neo*: nam ſi peripheria per *n* & *e* educta, extra *ai* caderet, debebat *ey* ipſam *ei* peripheriam ſemicirculo minorem, interſecare ante quam ad *i* pertingeret. quod abſurdum per ſe eſt manifeſtum.

At vero ſi alter eorum ſit obtuſus, reliquus acutus, ut in triangulo *uea*; vides hic ex demonſtratis ſemicirculum perpendicularem *feny* neceſſaria extra baſin *au* cadere, quod erat demonſtrandum.

XXXIII. PRO-

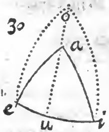
XXXIII. Propositio.

Si tripleurum ſphæricum eſt æquicrurum, perpendicularis à vertice, angulum & baſin biſecat.

IN eodem diagrammate in triangulo *ueo*, ſunto *ue eo* crura æqualia, atque *ef* perpendicularis: itaque per prop. 27 ut ſinus totus ad tangentem cruris, ita tangens baſis, ad ſinum anguli ab ijs comprehenſi; ſed in triangulis *uef oef, fe ue, fe oe* ſunt æquales, ergo quartus proportionalis idem, & peripheriæ eis debitæ quantitate eædem: idem judicium eſto de ſegmentis baſis *uf fo* per propoſ. 17.

XXXIV. Propositio.

Si tripleurum ſphæricum eſt acutangulum, ſingula latera quadrante ſunt minora. 9 pr. l. 4 Reg.



ESTO in diagrammate, propoſitum triangulum acutangulum *aei*, ajo latera *ae ei iu* ſigillatim eſſe quadrante minora: ſunto enim *io eo* peripheriæ perpendiculares ad baſin *ei*, eæ ad baſin angulos majores datis acutis *e, i*, conſtituent, & ſupra verticem *a* concurrent in polo *o*. per. conſ. 2. pr. 3. perpendicularis itaque ab *o* polo per *a* verticem demiſſa, interſecabit per propoſ. penultimam, baſin *ei*, ut puta in *u*, & fiet *uai* pars acuti, ad *a* quoque acutus. atque uterque angulus *uai uia* in triangulo rectangulo acutus; & ideo per propoſitionem 10, baſis *ai* quadrante minor. idem quoque de *ae* judicium eſto; eademque via de

via de *ei* quoque conficietur ad *a* & *i* excitatis perpendicularibus.

XXXV. Propositio.

Datis tripleuri ſpharici lateribus, angulus dato lateri oppoſitus cuiuſnam ſit affectionis definire.

IN planorum triangulorum lateribus hæc inſunt τεκμήρια, ut anguli qui dato lateri opponitur, affectionem ſtatim invenire queas, etiamſi ejus amplitudinem definite explicare nequeas: nam ſi baſis plus poteſt cruribus angulus ei ſubtenſus erit obtuſus; ſi æque, rectus, ſi minus acutus: ita hic aliquando uſui; quandoque etiam eſt neceſſarium, ut nobis conſtet cujuſnam affectionis ſit optatus aliquis in dato tripleuro angulus; nam ipſa accurata veritas hic nondum quæritur; eſt autem hic pro laterum affectionibus ea determinatio varia. Nam

1. Cum crura erunt affectionis diverſæ, & baſis quadrante non major, angulus ab ijs comprehenſus erit acutus:

2. At cum crura erunt affectionis ejuſdem, & baſis quadrante non minor, angulus ab ijs comprehenſus erit obtuſus.

Hoc utrumque enim ex undecima propoſitione conſequitur: Nam ſi in triangulo rectangulo, crura anguli recti ſint affectionis diverſæ, baſis eſt quadrante major; imminuta igitur baſi, ut ea ſit vel quadrans vel quadrante minor, etiam angulus minuetur, & pro recto fiet acutus.

Secundus caſus ex eodem theoremate eſt manifeſtus: Nam ſi in triangulo rectangulo crura ſint affectionis ejuſdem, baſis eſt quadrante minor; quare ſi baſis augeatur, ut ea quadrantem æquet, vel

vel etiam excedat, efficitur utique angulum oppoſitum adaugeri, & ex recto fieri obtuſum.

3. Cum autem crura erunt affectionis ejuſdem, & baſis quadrante minor, ſi tum ſinus complementi baſis eſt major facto ſub ſinibus à crurum complementis per radium diviſo, angulus eſt acutus, ſi minor obtuſus, ſi æqualis, rectus.

Id enim patet ex propoſ. 17 & propoſ. 11. nam ſi cruribus recti anguli datis, baſis quæratur, erit, ut ſinus totus, ad ſinum complem. cruris unius, ita ſinus compl. reliqui, ad ſinum complem. baſis recti; ergo ſi complementum baſis in dato triangulo hunc excedat, indicium eſt iſtam baſin minorem eſſe baſe recti; aut ſi excedatur majorem, & illic acutum hic angulum eſſe obtuſum.

4. Cum crura erunt affectionis diverſæ, & baſis quadrante major: ſi tum ſinus complementi baſis eſt major facto ſub ſinibus qui ad crurum complementa pertinent, angulus eſt obtuſus, cum minor acutus: ſi æqualis, rectus: Id enim ut tertium ex iiſdem locis derivatur.

Sed hoc utrumque compendioſè per ſolam proſthaphæreſin expediri poteſt: ſit enim pro tertio caſu crus *ae* 44 gr. 43 ſcr. *ei* 73 gr. 25 ſcr. *ai* 71 gr. 20 ſcr. & quæratur cujuſnam affectionis ſit angulus ad *e* cui opponitur latus *ai* in tripleuro *aei*.

	gr.	ſcr.	
Compl. crurum ſunt *ae*,	45.	17.	
ei,	16.	35.	
	44	43	
	61	18.	8771462
	28	8.	4715250
			4056212
			2028106

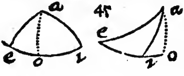
quare

quare factus à complementorū ſinibus eſt 2028106 ſinus autem complementi baſis *ai* 71 gr. 20 ſcr. eſt 3200619 major iſto; quare angulus ad *e* eſt acutus: ſi minor foret eſſet obtuſus per 3 determinationem: vel hoc modo, quia hujus inventi ſinus 2028106, complemento reſpondet peripheria 78 gr. 18 ſcr. ut proximè, indicium eſt, baſin recti majorem eſſe hac peripheria, atque ideo hunc angulum ad *e* acutum eſſe. Haud alia eſt ratio determinationis tertiæ: prima & ſecunda abſque ullo calculo ſe ipſas explicant.

XXXVI. PROPOSITIO.

Si perpendicularis cadat à vertice tripleuri, in baſin, ſinus complementi interſegmentorum baſis ab angulis ad perpendicularem; ſinibus complementorum crurum conterminorum ſunt proportionales.

ESTO tripleurum *aei*, & perpendicularis ab *a* in baſin *ei* demiſſa ſit *ao*, quæ in primo dia-

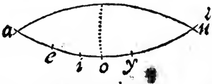


grammate intra, in ſecundo extra triangulum cadit, ajo igitur, ut ſinus complementi *ae*, ad ſinum complementi lateris *ai*, ita interſegmentum *eo* à crure primo *ae* & perpendiculari *ao* interceptum, ad interſegmentum ſecundum *oi*: ſunt enim *aeo aoi*, tripleura rectangula: atqui per prop. 17 primum modum, in rectangulis eſt, ut ſinus totus, ad ſecantem cruris, ita ſinus compl. baſis, ad ſinum compl. cruris reliqui; erit igitur quemadmodum ſinus totus, ad ſecantem cruris *ao*, ita ſinus compl. baſis *ae*, ad ſinum compl. cruris *oe*.

cruris *oe*, & ſic quoque ſinus compl. baſis *ai*, ad ſinum complem. cruris *oi*. Et ideo quoque, ut ſinus complementi *ae*, ad ſinum complem. *oe*: ita ſinus complem. *ai* ad ſinum complem. *oi*. & alterne, ut ſinus complem. *ae*, ad ſinum compl. *ai*; ita ſinus complem. *eo*, ad ſinum complem. *oi*.

LEMMA, ad id quod ſequitur.

Si duæ datæ peripheriæ ſint affectionis eiuſdem differentia peripheriarum complementorum differentiæ æqualis eſt: at earundem ſummæ differentia à ſemicirculo, complementorum ſummæ eſt æqualis.



SUnto datæ *ae ai* primũ quadrante minores, hic *ei* eſt earum differentia, & eadem quoque complementorum *oe oi*. res eadem erit ſi ambæ ſint majores, ut ſi datæ ſint *ue* & *ui*, earum differentia rurſum erit *ei*.

Secundò dentur peripheriæ *uy* & *ai*, harum ſummæ differentia à ſemicirculo eſt *yi*, quæ complementorum ſummæ eſt æqualis. res eadem erit ſi ambæ ſint quadrante majores ut *ui* & *ay*, eæ enim ſemicirculum excedunt ſuorum complementorum ſumma *yi*.

II. LEMMA.

Si duæ peripheriæ ſint affectionis diverſæ, differentia peripheriarum, complementorum ſummæ æqualis eſt: at earundem ſummæ differentia à ſemicirculo æquatur complementorum differentiæ.

VT in eodem diagrammate *iu* major, *ae* minor, ſummæ à ſemicirculo differentia eſt *ei*. & eadem

dem quoque eſt differentia complementorum *oe* & *oi.* vel ſi *ue* & *ai*, aſſumantur, datæ iſtæ ſemicirculum excedunt peripheria *ei*; & eadem *ei* differentia eſt inter complementa *oe* & *oi.*

Secundò dentur peripheriæ *euy* minor & *ui* major, harum differentia *yi*, æquatur ſummæ complementorum earundem *yo*, & *oi*.

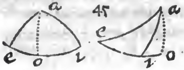
CONSECTARIUM.

Itaque

Datis lateribus tripleuri, dantur interſegmenta baſis, inter crura & verticis perpendicularem intercepta.

OPORTET autem ſciri utrum perpendicularis intra, an verò extra triangulum cadat; id autem è propoſitione 35 ubi angulorum ſpecies definitur, & è 32 ubi ex his perpendicularis caſus oſtenditur, conſtare poteſt; neque ſemper neceſſum eſt, utrumque angulum tentari: nam ex unius ſpecie, nonnunquam alterius quoque ſpecies ſtatim liquet. Ut ſi angulus majori cruri oppoſitus acutus deprehendatur, etiam is qui minori opponitur acutus erit; aut ſi is qui minori cruri opponitur obtuſus deprehendatur, etiam is qui majori opponitur obtuſus erit.

Sed uno aut altero exemplo hoc theorema per numeros illuſtremus; ita enim ejus uſus erit manifeſtior, & minus lubricus. Sit igitur in primo diagrammate latus *ai* 73 gr. 25 ſcr. & *ei* 44 gr. 43 ſcr. *ae* 71 gr. 20 ſec. 30 ſec. & quæratur angulus *aie*. Hic jam primum *aei* ſecundum præcepta propoſ. 35 acutus invenietur,

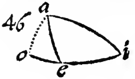


tur, atque ideo *aie* angulus minori lateri oppoſitus itidem acutus erit, & perpendicularis ex vertice *a* cadet intra triangulum. Sed cum *ei* tota ſit minor quadrante, multo etiam magis ſingula ſegmenta *eo* & *oi*. atque ideo per lemma primum, eorum ſummæ differentia à ſemicirculo, complementorum ſummæ erit æqualis, nempe 135 gr. 17 ſcr. atqui per propoſ. 36, ratio ſinuum qui ad ſingulas peripherias pertinet datur, nempe ea quæ eſt complementorum laterum conterminorum; Eſt igitur ratio complem. *eo*, ad complem. *oi*, quæ 3199240 ad 2854096. Fiat igitur per conſect. 1. pr. 13 l 1. ut horum ſumma 6053336, ad eorundem differentiam, 345144. ita tangens dimidiæ peripheriæ 135 gr. 17 ſcr. nempe 24311982 ad 1386213 tangentem dimidiæ differentiæ 7 gr. 53 ſcr. 34 ſec. quæ ad ſummæ dimidium 67 gr. 38 ſcr. 30 ſec. addita, & ab eodem ſubducta, dabit peripherias 75 gr. 32 ſcr. 4 ſec. & 59 gr. 44 ſcr. 36 ſec. quæ ſunt ſegmentorum baſis complementa; cumque minoris peripheriæ majus ſit complementum, erit ipſa *oe* 14 gr. 27 ſcr. 56 ſec. & *oi* 30 gr. 15 ſcr. 4 ſec.

Eſto nobis exemplum alterum in eodem diagrammate, nempe *ai* 160 gr. *ae* 15 gr. & baſis *ei* 170 gr. & quærantur ſegmenta baſis *io oe*. Hic primum per præcepta propoſ. 35 angulorum in baſi *e*, *i*, ſpeciem invenies: nempe eos eſſe acutos, & ideo per propoſ. 32 perpendicularem *ao* intra triangulum cadere intelliges; Sed cum *ae* baſis recti ad *o* ſit minor quadrante, & angulus ad *e* acutus, perpendicularis *ao* minor erit quam *ae*. Sed cum in triangulo rectangulo *aoi*, baſis ſit quadrante major, crura *ao oi* erunt affectionis diverſæ, & *oi* ideo major quadrante; quamobrem horum crurum *eo* & *oi* differentia à ſemicirculo, complementorum

differentiæ erit æqualis, per lemma 2. ea igitur erit 10 gr. Atqui per lib. 1. pr. 13 conſ. 2. data ratione ſinuum, & differentia peripheriarum, dantur ſingulæ: Nam complementum *ai* 70 gr. ejus ſinus 9396926. complementum *ae* 75 grad. ſinus 9659258, differentia 262332, ſumma 19059184, tangens dimidiæ differentiæ complementorum *eo* & *oi*, nempe 5 gr. eſt 874887: inde dabitur dimidia complementorum ſumma 81 grad. 3 ſcr. $26\frac{45}{100}$ ſec. atque ideo ſingula complem. 86 gr. 3 ſcr. $26\frac{45}{100}$ ſec. & 76 gr. 3 ſcr. $26\frac{45}{100}$ ſec. Cumque *io* ſit major quadrante, & *eo* minor, illi minus complementum & huic majus erit imputandum: quare *ia* erit 166 gr. 3 ſcr. $26\frac{45}{100}$ ſec. & *eo* 3 gr. 56 ſcr. $33\frac{55}{100}$ ſec.

Et tertium huc accedat exemplum. ſit latus *ai* 160 gr. *ae* 15 gr. & baſis *oi* 162 gr. 6 ſcr. $52\frac{2}{10}$ ſec. & quæratur ſegmenta ad verticis perpendicularem *io* & *eo*. Hic primum per prop. 35



invenietur angulus *aie* acutus, & *aei* obtuſus; itaque per prop. 2 perpendicul. *ao* cadet extra triangulum, & *ie* erit differentia ſegmentorum *io* & *oe*. & per 2 lemma eadem 162 grad. 6 ſcr. $52\frac{2}{10}$ ſec. complementorum ſummæ æqualis erit. ideoque per conſ. 1 propoſ. 13 lib. 1. dabuntur ſingula complementa: nempe ſi fiat ut ſumma 19056184, ad differentiam 262332, ita tangens 81 grad. 3 ſcr. $26\frac{45}{100}$ ſec. 63549080, ad tangentem dimidiæ differentiæ 874832. cui cedunt gr. 5. atque hinc complementa ſingularum dantur 86 grad. 3 ſcr. $26\frac{45}{100}$ ſec. & 76 grad. 3 ſcr. $26\frac{45}{100}$ ſec. & ipſa *io* peripheria 166 gr. 3 ſc. $26\frac{45}{100}$ ſec. atque *eo* 3 gr. 56 ſc. $33\frac{55}{100}$ ſec. Hanc varietatem ſingulis exemplis expreſſimus, ut viam

viam tyronibus ſterneremus : habet enim hoc exercitium aliquam voluptatem cum utilitate conjunctam.

XXXVII. Propositio.

Datis tripleuri lateribus, angulos invenire.

HActenus quidem perpendicularis à cruribus diſtantiam novo modo inveſtigavimus: ſupereſt ut ejuſce uſum porrò oſtendamus. Sit itaque in diagrammate primò propoſitionis antecedentis, *ae* 71 grad. 20 ſcr. 30 ſec. *ai* 73 gr. 25 ſcr. & *ei* 44 gr. 43 ſcr. ut in primo antecedentis conſectarij exemplo: & hinc jam dantur nobis ſegmenta *io* 35 gr. 15 ſcr. 4 ſec. & *oe* 14 gr. 27 ſcr. 56 ſec. unde in triangulo rectangulo *aio* dabitur angulus *i*, per propoſ. 27, ſeu rectangulorum διδομένον XIII. Data baſe & crure, datur angulus ab ijs comprehenſus: Nam ut ſinus totus 10000000; ad tangentem complem. baſis *ai* 2977962, ita tangens cruris *oi* 5832088 ad ſinum complem. anguli *i* 1736773 cui cedunt 10 gr. 0 ſcr. 6 ſec. ejus complementum igitur 79 grad. 59 ſcr. 54 ſec. pro angulo *i*; nam is ante acutus nobis eſt inventus.

Hac eadem via è triangulo *aoe*, invenietur angulus *e* 85 gr. Et per διδομένον III ambo anguli *eao oai* ſimul 47 gr.

Si perpendicularis cadat extra, inventis ſegmentis ut prius, anguli per eaſdem propoſitiones inveſtigabuntur, ut ante.

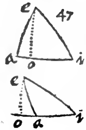
Atque ita reductione obliquanguli trianguli ad rectangula, anguli nobis quoque ſunt inventi, at contra, Regiomontanus etiam docuit ſimili reductione, è datis angulis trianguli latera invenire,

L 2 quam

quam ad rem hoc theorema prævium propoſuit & demonſtravit.

XXXVIII. PROPOSITIO.

Si ſit perpendicularis à vertice tripleuri in baſin, ſinus angulorum à cruribus ad perpendicularem comprehenſorum, ſinibus complementorum angulorum in baſi proportionales ſunt. 20 *pr. l.* 4 *Regiomont.*



VT in diagrammate, *eo* perpendicularis ſit à vertice in baſin *ai*, quæ utrum extrà, an intra triangulum cadat nihil refert: cum enim per propoſitionis 19 modum primum, ſit, ut ſinus totus, ad ſinum complementi cruris, ita ſinus anguli adjacentis, ad ſinum complem. anguli dato cruri oppoſiti: erit igitur ut radius, ad ſinum complem. *ao*, ita ſinus *aeo*, ad ſinum complem. ad *a*: & ita quoque ſinus *ieo*, ad ſinum complem. ad *i*. Quamobrem erit alternis, ut ſinus complem. anguli *a* ad ſinum complem. *i*, ita ſinus *aeo* ad ſinum *ieo*. quod erat demonſtrandum.

Hinc igitur datis angulis trianguli, & ab angulo quocunque perpendiculari in latus oppoſitum demiſſa, dantur anguli ſingulares, ab ejus cruribus & perpendiculari comprehenſi: utrum verò perpendicularis demiſſa extra an intra triangulum cadat, id anguli ad baſin coarguent: cum enim affectionis ejuſdem erunt, perpendicularis cadet intra, cum diverſæ extra, per propoſ. 32.

Dentur igitur in triangulo *aei*, angulus *a* 85 gr.
e 80

e 80 gr. *i* 47 gr. & perpendicularis ab *e* ſit *eo*, quæ baſin *ai* interſecabit, quia anguli ad *a* & *i* hic ſunt acuti: ſinus complementi *a* eſt 871557 & ſinus complementi *i* eſt 6819984. Horum ſumma 769-1541, differentia 5948427, angulus ad *a* 80 gr. qui ſecundum has rationes eſt dividendus, per prop. 13 lib. ſecundi; Vt ſumma, ad differentiam, ita tangens dimidiæ peripheriæ, ſeu dimidij anguli *a* 40 grad. 8390996, ad tangentem dimidiæ differentiæ 6489366, cui cedunt 32 grad. 58 ſcr. $51\frac{2}{3}$ ſec. qui ad illum ſemiſſem additi, dabunt 72 grad. 54 ſcr. $51\frac{2}{3}$ ſec. pro angulo *oei*, qui majori cruri adjacet, majus autem crus majori quoque angulo opponitur; & indidem ſubducti dabunt reliquum minorem *aeo* 7 gr. 1 ſcr. $8\frac{1}{3}$ ſec.

Si perpendicularis *eo* cadat extra, ut in diagrammate ſecundo, ubi angulus *eai* datur 95 grad. *aei* 65 grad. 57 ſcr. $43\frac{1}{3}$ ſec. *i* 47 grad. tum *aei* differentia angulorum *oei aei* dari intelligitur: fiat itaque ut differentia ſinuum qui pertinent ad complementa angulorum in baſi 5948427, ad eorundem ſummam 7631541: ita tangens dimidij anguli verticalis *aei* 6489368, ad 8390998 tangentem dimidiæ ſummæ: dantur itaque ſinguli anguli *oei* 72 gr. 58 ſcr. $51\frac{2}{3}$ ſec. & *oea* 7 gr. 1 ſcr. $8\frac{1}{3}$ ſec. quemadmodum imperabatur.

XXXIX. Propositio.

Datis tripleuri angulis, latera invenire.

Oportet autem datos angulos, duobus rectis eſſe majores, & ſex rectis minores; ſed ita ut duorum maximorum à quatuor rectis differentia, addito minimo, duobus item rectis ſit major, per conſ.2 propoſ.7 ſecus operam luſeris.

Sunto itaque in triangulo *aei*, anguli dati, & *a* quidem 85 gr. *e* 80 gr. *i* 47 gr. & quærantur latera *ae ei ai*.

Demiſſa itaque perpendiculari à quocunque angulo, puta *e* in baſin *ai* inventi ſunto per antecedentem, anguli à cruribus & perpendiculari comprehenſi *aeo* 7 gr. 1 ſcr. $8\frac{1}{3}$ ſec. & *oei* 72 gr. 58 ſcr. $51\frac{2}{3}$ ſec. Datis itaque in triangulo *eao* rectangulo, duobus angulis *oae aeo*, dabitur baſis per propoſ. 30. Nam ut 10000000, ad tang. complem. anguli *eao*, 3060930, ita tang. compl. *e*, ad 2854363. ſinum complem. baſis *ae*, cui cedunt 16 gr. 35 ſcr. 6 ſec. & ejus complementum pro ipſa baſi 73 grad. 24 ſcr. 54 ſec.

Eadem ratione concludes latus *ei* 44 gr. 43 ſcr. 1 ſec.

Tum etiam ſegmenta baſis per propoſit. 14. *oi* 66 gr. 24 ſcr. $33\frac{1}{3}$ ſec. & *oa* 4 grad. 55 ſcr. $59\frac{2}{3}$ ſec. quorum ſumma, quia *eo* perpendicularis baſin ſecat, dabit totam *ai* 71 gr. 20 ſcr. 33 ſec.

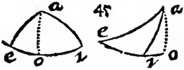
Si, ut in ſecundo diagrammate, perpendicularis cadat extra triangulum, ubi angulus verticis *aei* datur 65 gr. 57 ſcr. $43\frac{1}{3}$ ſec. *a* 95, & *i* 47. tum *oa* & *oi* dabit baſin *ai* 61 gr. 28 ſcr. 34 ſec.

XL. Pro-

XL. PROPOSITIO.

Datis lateribus duobus, & angulo ab iis comprehenſo, reliquum latus & angulos invenire.

ET hoc quoque adhibita reductione ad rectangula nunc abſolvemus, poſtmodum etiam abſque ea. Sit igitur triangulum datum *iae*, cujus angulus *aei* ſit 80 gr. ejus crura *ae* 73 gr. 25 ſcr. *ei* 44 gr. 33 ſcr. hic à termino cruris alterius ut *a*, in reliquum crus *ei*, perpendicularis *ao* eſt demittenda, ita enim reſolutio oportuna erit, ut reliqui termini tuto & conſtanter inveniri poſſint. itaque in triangulo *oea* ex data baſe recti *ae*, & angulo *e*, dabitur per propoſit. 14 perpendicularis *ao* 70 gr. 42 ſcr. 25 ſec. Et per propoſ. 29. angulus *oae* 31 gr. 42 ſcr. 42 ſec.



Denique per propoſ. 26. invenietur crus *oe* 30 gr. 15 ſcr. 2 ſec. Hujus & lateris dati *ei* differentia, eſt 14 grad. 27 ſcr. 58 ſec. pro *oi*. & quia *ei* majus eſt quam *eo*, efficitur perpendicularem *ao*, cadere intra triangulum, atque angulum ad *i* acutum eſſe, cum *e* datus quoque ſit acutus.

Inde datis cruribus recti *ao* 70 gr. 42 ſcr. 25 ſec. & *oi* 14 gr. 27 ſcr. 59 ſec. dabitur per propoſit. 18. baſis *ai* 73 gr. 25 ſcr. 0 ſec.

Et angulus *aio* 85 gr. 0 ſcr.

Ac denique *iao* 15 gr. 17 ſcr. 18 ſec. qui ad angulum *oae* 31 gr. 42 ſcr. 42 ſec. additus, dabit totum *eai* 46 gr. 59 ſcr. 56 ſec.

At vero ſi, ut in ſecundo diagrammate, perpendicularis extra cadere deprehendatur, quia *ea* ma-

major ſit quam datum latus *ei*: tum aſſumenda erit differentia inter *eo io*, unde dabitur iſto caſu *ei* 15 grad. 47 ſcr. 4 ſec. Et ex angulorum *eao iao* differentia, dabitur angulus *eai* 16 gr. 25 ſcr. 24 ſec.

XLI. PROPOSITIO.

Dato latere tripleuri & angulis duobus eidem adjacentibus, reliqua latera & angulum invenire.

ESTO propoſitum triangulum in eodem diagrammate *aei*, deturque latus *ae* 73 gr. 25 ſcr. o ſec. & angulus ei adjacens *aei* 80 gr. & alter *iae* 46 gr. 59 ſcr. 56 ſec. & quærantur latera *ai*, *ie*, cum angulo reliquo *i*. Ut igitur termini ad ſolutionem idonei ſint illibati, demittam perpendicularem ab alterutro augulorum datorum in latus oppoſitum, ut hic *ao*, ab angulo dato *a* in latus ignotum *ei*, quæ utrum extra an intra triangulum cadat ex quantitate anguli *eao* evincetur: is enim ſi minor inveniatur dato *eai*, tum perpendicularis cadet intra triangulum; at extra, ſi major. Cum igitur in triangulo rectangulo detur baſis recti *ae* 73 gr. 25 ſcr. & angulus *aeo* 80 grad. inde quoque per propoſitionem 14. dabitur perpendicularis *ao* minor quadrante per propoſ. 11 uel quia *aeo* angulus oppoſitus acutus eſt: erit itaque *ao* 70 gr, 42 ſcr. 25 ſec.

Inde etiam crus *oi* erit ejus affectionis, cujus eſt *oa*, nempe quadrante minus per converſam propoſ. 9 & per converſam prop. 10 angulus *oae* quoque acutus.

Itaque porrò per propoſit. 26. Dabitur crus *eo* 30 gr, 15 ſcr. 2 ſec,

Et per propoſitionem 29, angulus *oae* 31 gr. 42 ſcr. 42 ſec, qui minor eſt dato *eai* 46 grad. 59 ſcr. 56 ſec,

56 ſec. reliquus itaque *iao* dabitur quoque 15 gr. 17 ſcr. 14 ſec.

Atque hinc denuo datis in triangulo rectangulo *aoi*, crure recti *ao*, & angulo *iao* adjacente, dabitur per propoſit. 19 *oia* angulus, hoc caſu minor recto, per propoſ. 8, 84 gr. 59 ſcr. 59 ſec.

Et quia uterque angulus in baſi *ai*, eſt ejuſdem affectionis, baſis *ai* quadrante minor eſt per prop. 10. Ejus autem quantitas invenietur per propoſit. 28. 73 gr. 25 ſcr.

Denique cum per converſam 9 propoſ. *oi* crus ſit minus quadrante: nam baſis *ai* eſt quadrante minor, efficitur quantitas cruris *oi* 14 grad. 27 ſcr. 58 ſec. quæ hoc caſu addita ad *oe* 30 gr. 15 ſcr. 2 ſec. dabit totum latus *ei* 44 gr. 43 ſcr.

Si perpendicularis *ao* caderet extra, ſumenda eſſet differentia angulorum *eao*, *eai*, & ſegmentorum ad perpendicularem *eo*, *oi*.

IDEM ALITER.

Sed licet idem etiam aliter præmiſſo hoc lemmate.

SINVS *interſegmentorum baſis, tangentibus complementi angulorum conterminorum ſunt proportionales.*

Eſto enim in eodem diagrammate tripleurum *eai*, & *ao* perpendicularis ab *a* in baſin *ei*. Erit itaque per propoſ. 25. ut ſinus totus, ad tangentem cruris recti *ao*, ita tangens complementi anguli oppoſiti *i*, ad ſinum cruris adjacentis *oi*. & ita tangens complementi anguli *e*, ad ſinum cruris *eo*. ut itaque tangens complem. *i*, ad tangentem compl. *e*: ita ſinus *oi*, ad ſinum *oe*. data autem ratione ſinuum *io oe*, & ipſa peripheria *ei*, dabuntur ſingulæ per propoſ. 13 lib. 1.

lis tripleuris nuntium remiſſuri, & omnia abſque his explicaturi.

Eſto itaque triangulum propoſitum ut ante, *aei* prius, & ſunto data latera *ae* 71 gr.20 ſcr.30 ſec. *ai* 73 gr.25 ſcr.atque angulus *aie* 80 gr.0 ſcr. & quæratur angulus *e*. Demittatur itaque perpendicularis *ao* ab angulo *a* abs datis cruribus comprehenſo, ut ſalvi ſint & illibati termini qui ad ſolutionem ſunt idonei. Hic itaque primum per prop. 14 in tripleuro rectangulo *iao*, ex angulo *i* & baſe *ai* invenies perpendicularem *ao* 70 gr.42 ſcr.28 ſec. inde per propoſ. 16 in tripleuro rectangulo *eao*, ex baſi *ae*, & crure *ao*, invenies angulum *aeo*: is autem acutus eſt per propoſ. 10. nempe 85 gr.0 ſc.18 ſec. verum an angulus *iea* in ipſo triangulo, acutus ſit ille, an verò obtuſus 94 gr.59 ſc.42 ſec. id nondum liquet, ut in appoſitis diagrammatis videre eſt: Itaque ejus ſpecies neceſſariò definiri debet; ſunt tamen caſus quidam qui determinationem à ſe ipſis proferant.

1 Ut, ſi angulus ille ad *e* rectus inveniatur.

2 Vel, ſi angulus majori lateri oppoſitus detur acutus, tum is qui reliquo minori lateri opponitur quoque acutus erit.

4 Vel, ſi angulus minori lateri oppoſitus detur obtuſus, tum is etiam qui reliquo majori opponitur obtuſus erit.

4 Si latera ſint æqualia etiam angulos æquari manifeſtum eſt.

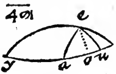
5 Denique ſi angulus datus acutus ſit, latuſque ei adjacens majus quadrante, oppoſitum verò non minus illius reſiduo, angulus priori lat. oppoſitus tantum obtuſus erit: ſin ang. datus ſit obtuſus, & latus adjacens minus quadrante, alterumq; minus hujus reſiduo, angulus priori oppoſitus tantū acutus erit.

XLIII. PRO-

XLIII. PROPOSITIO.

Datis duobus tripleuri angulis, & latere uni eorum oppoſito, latus reliquo angulo oppoſitum invenire.

ET hoc problema ferè eſt anceps: ſit enim in tripleuro *aei* diagrammatis propoſ. 38, angulus *a* 85 gr. & *i* 80, & latus *ae* 71 gr. 20 ſcr. 30 ſec. ſitque ab angulo *e* perpendicularis *eo*: quare in triangulo rectangulo *aeo* datur baſis *ae*, & angulus *a*, unde per 14 propoſ. dabitur perpendicularis *eo* 70 gr. 42 ſcr. 24 ſec. Hinc in tripleuro rectangulo *ieo*, dato crure recti *eo*, & angulo oppoſito *i* 80 gr. dabitur quoque baſis *ei* complementum per prop. 15. 16 gr. 34 ſcr. 50 ſec. Atqui ex determinatione iſti propoſ. 15 adjecta, debet definite conſtare, utrum baſis quadranti cedat an præſtet; id autem ex datis non ſemper elici poteſt, ut in hoc altero diagrammate:



Sint enim *yei*, *yai* ſemicirculi, & ex *e* duæ peripheriæ æquales *ea*, *eu*, atq; ita anguli *y* & *u* in tripleuro *eyu*, angulis *a* & *i* in tripleuro *aei* æquales quidem erunt, & latus *ae* lateri *au*: quamobrem non conſtabit continuò, an ex ijs datis quæratur *ei* peripheria minor quadrante, an verò *ye* major; Quare id complementum quod ſupra nobis eſt inventum 16 grad. 34 ſcr. 50 ſec. addi aut demi poterit à quadrante, ut nempe latus quæſitum ſit, 106 gr. 34 ſcr. 50 ſec. vel etiam 73 gr. 25 ſcr. 10 ſec. Id enim incertum eſt: atque ideo quoque angulus *aei*. & latus commune *ai*, hoc caſu geminam habet determinationem.

nationem. Eſt tamen ubi ex datis ipſa determinari queant: Nempe

1. Si latus reliquo angulo oppoſitum quadranti inveniatur æquale.

2. Vel, ſi latus majori angulo oppoſitum, detur quadrans aut quadrante minus, tum latus reliquo oppoſitum quadrante quoque minus erit.

3. Vel, ſi latus minori angulo oppoſitum ſit quadrans, aut quadrante majus, tum reliquum latus quoque majus erit.

4. Vel, ſi dati anguli ſint æquales, etiam latera iſtis oppoſita æquari manifeſtum eſt.

5. Denique ſi latus datum quadrante majus ſit, angulus autem ei oppoſitus obtuſus, & alter acutus, reliquum latus huic oppoſitum non erit minus prioris reſiduo: ſin vero detur latus quadrante minus & ang. oppoſitus acutus, reliquus obtuſus, latus huic oppoſitum erit minus prioris reſiduo.

FINIS LIBRI TERTII.

CANO-

CANONICÆ TRIANGVLORVM DOCTRINÆ,

LIBER QVARTVS.

DE TRIPLEVRIS OMNIBVS VNIVERSIM,

Abſque nlla reductione ad Rectangula.

I. PROPOSITIO.

Datis latteribus tripleuri, angulos invenire.

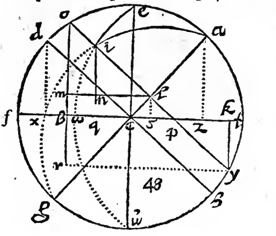
QUOD *ſit ſub ſinibus crurum auguli quæſiti, & quod ſub complementorum eorundem, applicetur ad ſinum totum:*

Et erit ut primus quotus, ad ſecundum plus vel minus ſinu complementi baſis; Ita ſinus totus, ad ſinum complementi anguli huic oppoſiti.

Eſto enim propoſitum tripleurum *aei*, cujus latera data ſint *ae* & *ei*, & quæratur angulus *eai*. Intelligatur itaque *aegt* planum maximi circuli cujus centrum *c*, & *ag*, *dh*, item *eu tf* normales diametri ut in analemmatorum deſcriptionibus aſſolet, & *ao* ſegmentum cruri *ai* æquale, ut *oy* ſit communis ſe-

ctio

ctio ejuſdem plani, & circuli intervallo cruris *ai*, ex *a* polo deſcripti, & ideo parallela contra *dh*; &



ab *i* perpendicularis intelligatur ſuper hãc communẽ ſectionem *oy*, ea itaque abſumet *il* ſinum complementi anguli *oai*, in ſui paralleli diametro: punctum igitur *i* nunc terminus perpendicularis nobis intelligatur; porrò cum *fe*, *da*, *et*, quadrantes ſint, ob communia ſegmenta, *fd ea*, & *de at* peripheriæ inter ſe æquabuntur: & *od* complementum erit *ai* vel *ao*; & *ob* perpendicularis diametro *ft*, continuetur donicum occurrat eidem diametro parallelæ *yr*, & ab *i* ſit perpendicularis *iq*, denique ab *l* ſunto perpendiculares in ductas *lm ls*.

In hoc itaque diagrammate quæritur *iq* ſinus complementi lateris *ei*, quæſito angulo ad *a* oppoſiti: cum igitur *iq* componatur ex *in* & *nq*. & *qn* ſive *ls* conſtet ex ſimilitudine triangulorum *caz*, *cls*, nempe ut ſinus totus *ca*, ad *az* ſinum complementi cruris *ae*; ita *cl* ſinus complementi cruris *ai* vel *ao* ad *ls*: hoc erit inventum primum.

Inde cum *lom cdx* triangula ob laterum paralleliſmum ſint ſimilia, erit ut *cd* ſinus totus, ad *dx* ſinum *fd* ſeu cruris *ea*, (nam *de* eſt complementum commune) ita *lo* ſinus cruris *ao* vel *ai*, ad *om* quartum:

tum: porro cum *ei* latus ſit datum, ejuſdemque complementum ſit *io*, & hujus ſinus *iq*, cujus & inventi primi *ls* modo ſumma, alias differentia eſt *in*. Cumque triangula *mol*, *nil* ſint ſimilia, erit quoque, ut *mo* inventum ſecundum ad *in* complementi lateris tertij & inventi primi ſummam vel differentiam, ita *ol* ſemidiameter paralleli, ad *il* ſinum complementi anguli quæſiti in eodem parallelo; ſeu quod idem ſit in maximo parallelo, ita ſinus totus, ad ſinum complementi anguli quæſiti. Quod utique erat demonſtrandum.

Verumenimvero cum non ſemper æquè feliciter demonſtrationum ſumma, & caſuum varietas in additione & ſubductione, & angulorum ſpecies oculis obverſetur, eas ſuis præceptis breviter complectemur.

Casvvm Determinatio.

Sumetur autem ſumma.

1. Si crura ſint *affectionis eiuſdem*, & baſis *quadrante maior*, angulus huic oppoſitus obtuſus eſt.

2. Si crura ſint *affectionis diverſæ*, & baſis *quadrante minor*, angulus qui quæritur acutus eſt.

At contra aſſumetur differentia.

3. At ſi crura ſint *affectionis eiuſdem* & baſis *quadrante minor*, ſi tum quotus primus ſecundo cedat, angulus qui quæritur acutus eſt; ſin præſtet, obtuſus.

4. Si crura ſint *affectionis diverſæ* & baſis *quadrante maior*; ſi tum quotus primus ſecundo cedat, angulus qui quæritur obtuſus eſt; ſi præſtet acutus.

Quod

Quod ſi nulla ſit differentia inter quotum primum & ſecundum, id argumento erit angulum quæſitum eſſe rectum.

Exemplum in numeris ſubjicio. ſit *ae* 47 gr. 43 ſcr. *ai* 73 gr. 25 ſcr. baſis anguli ad *a* quæſiti *ei*, ſit 71 gr. 20 ſcr. 30 ſec.

		ſinus	ſin. comp.
ae.	44 gr. 43 ſcr. 0 ſec.	7036014	7105948
ai.	73. gr. 25 ſcr. 0 ſec.	9584056	2854096
ei.	71 gr. 20 ſcr. 30 ſec.	9474431	3199240

Factus ſub complementis *ae* & *ai* per radium diviſus erit 2028105 pro *ls*, qui cum minor eſt ſinu complementi *ei* oſtendit angulum quæſitum ad *a* eſſe acutum: & cum latera ſint quadrante minora; ſubducatur *ls* de *iq* 3199240 ſinu complementi lateris tertij *ei*, reliqua erit *in* 1171135. Dehinc factus ſub ſinibus crurum eorundem *ai*, & *ae* vel *fd*: applicatum ad radium, dabit *om* 6743355. Fiat itaque ad extremum, ut inventum ſecundum, ad ſummam vel differentiam inventi primi, & complementi lateris tertij (hoc caſu ut diximus differentia eſt ſumenda) 1171135, Ita radius, ad ſinum complementi anguli *eai* 1736726 cui cedunt 10 gr. 0 ſcr. 5 ſec. & cum hic initio oſtenſus ſit acutus, erit igitur angulus quæſitus *eai* 79 gr. 59 ſcr. 55 ſec.

Hic autē notandum tibi id eſt, primas duas proportiones, cum ex ſinibus conſtent, per ſolam proſthaphæreſin expeditiſſime abſolvi poſſe, hoc modo:

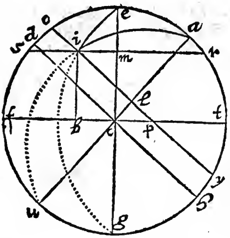
	ae. 44. 43				
	ai 73 25				
Compl.	*ae* 45 17				
Sum.	118. 42	8771462			
Diff.	28 8	4715250			
		13486712	dimid.	6243356	
		4056212		2058106	

hic *ai* eſt major complemento *ae*, itaque ſummæ ſemiſſis, eſt factus ſub ſinibus, differentiæ autem dimidium ſub eorundem complementorum ſinibus, reliqua inſtituantur ut ſupra.

Hoc illud eſſe exiſtimo, quod Regiomontanus ſub finem propoſ. 43 lib. 4 obiter indicare videtur, erit (inquit) opus omnino ſimile ei, ubi ex altitudine ſolis data, quæritur diſtantia ejus à meridie. Et profecto nos ex analemmate id ita expreſſeramus, priuſquam id cuiquam in mentem ſciremus veniſſe. Verum age iterum exprimamus quoque

II. Idem Aliter.

Datis lateribus tripleuri, angulos invenire.



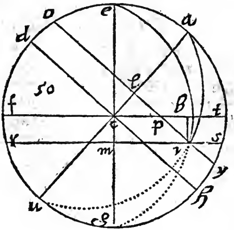
Sit propoſitũ tripleurum *eai*, cujus lateribus datis quæratur angulus ad *a*.

Enimvero quod ſit ſub tangente complemẽti cruris primi, & ſinu complementi ſecundi, applicetur ad radium, Itemque id quod ſub ſecante complementi cruris primi, & ſinu complementi baſis.

Et erit, ut ſinus totus, ad ſecantem complementi cruris ſecundi, ita inventorum ſumma vel differentia, ad ſinum complementi anguli ab ipſis comprehenſi.

Caſuum

Caſuum determinationes ſunt ut ante in modo præmiſſo, illæ igitur iſtinc repetantur.



Compleatur enim circulus maximus *ea yu* ut ante, & cõmunis ſectio ejus, atque paralleli intervallo cruris *ai* vel *ao* ex *a* polo deſcripti ſit *oy*: cõmunis autem ſectio paralleli, intervallo baſis *ei* vel *es* ex polo *e* deſcripti, ſit *sr*, horum autem deſcriptorum circulorum communis ſectio in *i*, perpendicularis erit utriq; rectæ *sr* & *oy* in communi ſectione; ita ut *i* in ſuperficie ſphæræ poſitum, oculo ad perpendiculum inſpectante, videatur *i* punctum in plano. Eritque *il* ſinus complementi anguli *eai*, in parallelo cujus diameter *oy*: & *im* ſinus complementi anguli *iea*, in parallelo cujus diameter *sr*; triangulorum ſimilitudo conſtat è ſuis perpendiculis. Quamobrem ut in triangulo *clp* inveniatur *lp*, erit ut ſinus totus, ad tangentem anguli *lcp*, qui eſt complementum *eca*, vel cruris primi *ea*, ita *lc*, ſinus *od* quæ eſt complementum *ao* vel *ai*, ad *lp*, hoc primum:

Secundo ob ſimilitudinem *bip clp*, angulus *bip* angulo *act*, erit æqualis: & ideo, ut ſinus totus, ad ſecantem *bip*, qui eſt complementum *eca*, ita *ib* ſinus complementi baſis *ei* ſeu *es*, ad *ip*; itaque differentia vel ſumma *ip lp* dabit rectam *il*, ſinum

 comple-

complementi *oai* in parallelo cujus diameter *ol*. Fiat itaque ut *ol*, ſinus *ao* vel *ai* lateris ſecundi, ad *il*, ita ſinus totus, ad ſinum complementi maximi circuli ei reſpondentem, hoc eſt per propoſ. 19. lib. 1. ut Radius, ad ſecantem complementi *ai* lateris ſecundi, Ita *il*, ad ſinum complementi quæſiti anguli. Porrò anguli quæſiti ſpecies, & additionis & ſubductionis ratio, ſequitur leges modo antecedente expoſitas. Exemplum ad primum diagramma compoſitum: ſit

1 *ae* 44 grad. 43 ſcr. tan.com. 10099394.
ſec.com. 14212592.
2 *ai* 73 grad. 25 ſcr. ſin.com. 2854096.
ſec.com. 10433905.
baſ. *ei* 71 gr. 20 ſcr. 30 ſec. ſin. comp. 3199240.

Rectangulum è tang. complementi cruris primi *ae*, & ſinu compl. ſecundi *ai*, ad radium applicatum eſt *lp* 2882464.

Rectangulum è ſecante compl. cruris primi *ae*, & ſinu compl. baſis *ei*, eſt *ip* 4546946, hoc loco differentia erit *li* 1664485.

Erit itaque, Ut ſinus totus 10000000 ad ſecantem compl. cruris ſecundi *ai* 10433995, ita *li* inventa 1664485, ad 1736722 ſinum complementi anguli *eai*: cui cedunt 10 grad. 0 ſcr. 5 ſec. hoc complementum, quia angulus hoc caſu eſt acutus erit à 90 grad. deducendum, & dabitur anguli *eai* quantitas 79 grad. 59 ſcr. 55 ſec. ut ante.

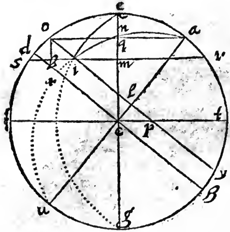
Potuit etiam alius modus inveniendi anguli *iae*, quæſiti ex eodem diagrammate à nobis elici qui duabus multiplicationibus & una diviſione ut primus

mus : itemque alius qui tribus multiplicationibus, ut ſecundus abſolvi poſſit. Sed id nunc ſatis eſto, tum ad facilitatem, tum ad varietatem hac ratione explicandam : neque enim arti propoſitum eſt omnia cujuſque modi ea ſint proponere, ſed ea tantum quæ facilitatem cum utilitate habent conjunctam. Et profecto ſi cui libeat varietatem experiri, viam hic habet planam ; Primus modus quem propoſuimus, calculi ob proſtaphæreſin facilitate, hunc ſuperat : hic autem viciſſim nulla adhibita diviſione totum negotium abſolvit. Et hic jam manum de tabula tollerem, niſi apud Regiomontanum libri 5 propoſitione ſecunda alius prætérea extaret modus, qui reliquos antecellat non tam calculi facilitate, quam determinationis felicitate, quam de ſuo ſemper affert, ut nullis novis hic ſit opus præceptis ; quamuis non ſim neſcius ob lubricitatem calculi à viris doctis tantum caute adhiberi : id enim jam olim Nonius alijque monuerunt : attamen ob artis perfectionem idem ille huc quoque aggregetur, ut cuique ſuo arbitrio frui liberum ſit ; nos ſane poſtea faciliorem exhibebimus modum, quam geminâ multiplicatione vitatâ diviſionis moleſtiâ abſolvimus, non tamen minus cautè adhibendum quam eſt hic, ob calculum nimis lubricum ; ſed en tibi modum Regiomontani cui noſtrum ſubjungemus.

III. IDEM ALITER.

Per ſinus verſos.

Vt rectangulum ſub ſinibus crurum anguli quæſiti, ad radij quadratum; ita differentia inter ſinum verſum baſis, & ſinum verſum differentiæ crurum, *ad ſinum verſum anguli oppoſiti. Reg. lib. 5 pr. 2.*



ESTO enim triangulum propoſitum *aei*, cujus ſingula latera dentur, & quæratur angulus ad *a*, ac reliqua quidẽ ſunto ut prius, & ab *o* ſit perpendicularis *ob*; cumque *oe* ſit differẽtia crurum *ae* & *ai*, cui *ao* ponitur æqualis, erit *oq* ejus ſinus rectus, & *cq* ſinus verſus, & eodem modo *sm* ſinus rectus, *cm* ſinus verſus *es*, hoc eſt baſis *ei*; differentia ſinuum verſorum eſt *mq* ſeu *ob*; eſt autem *oi* ſinus verſus anguli *oai*, in menſura paralleli *oy*, & *dx* ejuſdem anguli ſinus verſus in menſura maximi, cujus diameter *dh*: ob ſimilitudinem igitur peripheriarum erit ut *dc* ad *dx*, ita *lo* ad *oi*; & cum ob parallelíſmum angulus *oib* angulo *fpo* hoc eſt ipſi *eca* æqualis ſit, triangula *acn*, *oib*, erunt ſimilia, atque ideo latera *na ac*; *bo*, hoc eſt *mq*, & *oi* proportionalia,

nalia, ſi itaque has proportiones ſibi mutuo ſubjicias hoc modo

la *oi* *cd*. *dx*
na *ac* *ob* *oi*

erit quoque propter earundem rationum compoſitionem ut *lo* in *na*, ad *cd* in *ca* hoc eſt ad radij quadratum, ita *ob* in *oi*, ad *dx* in *oi*, ſeu rejecta communi altitudine *oi* ita *ob* ſeu *mq* differentia inter *eq* & *em*, ad *dx* ſinum verſum anguli quæſiti; Sed in calculo terminus uterque prior per radium dividatur,

ſit *ae* 44 gr. 43 ſcr. ſinus 7036014
ai 73 gr. 25 ſcr. ſinus 9584056
ei 71 gr. 20 ſcr. 30 ſec. ſin. verſus 6800760.
differ. crurum *ae ai* 28 gr. 42 ſcr. ſin. verſ. 1228538.
differentia ſin. verſ. 5572222

ut 67433552192784 ad 100000000000000, hoc eſt ut 6743355 ad 10000000, ita 5572222 ad 8263278 ſinum verſum anguli quæſiti, qui de radio deductus relinquet ſinum complementi 1736722, cui cedunt 10 gr. 0 ſcr. 5 ſec. unde ipſe ideo angulus *eai* datur, 79 gr. 59 ſcr. 55 ſec.

Eſto exemplum ſecundum tripleurum *iag*, & quæratur angulus ad *g*:

ag 135 gr. 17 ſcr. ſinus } idem qui ſuprà.
ai 73 gr. 25 ſcr. ſinus }
ig 108 gr. 39 ſcr. 30 ſec. ſinus verſus 13199240
Differ. crur. *ag* & *ai* 61 gr. 52 ſcr. ſin. verſ. 5284750.

Erit igitur ut 6743355, ad radium 10000000, ita differentia ſinuum verſorum 7914490; ad 11736724, qui cum major ſit radio, angulus qui quæritur eſt obtuſus, radius de eo ſubductus dabit 1736724 ſinum complementi, cui cedunt 10 gr. 0 ſcr. 5 ſec. hi ad quadrantem additi, dabunt 100 gr. 0 ſcr. 5 ſec. amplitudinem anguli *iag*. Vides hic nulla

determinatione opus eſſe : periculum erroris quod magni viri culpant in ſinibus verſis, nullum erit ſi majoribus ſinuum tabulis utaris : nam Rhetici beneficio id nobis deinceps licet, & maximè quidem cum factus à crurum ſinibus ſola proſtaphæreſi inveniri poſſit.

Ex iſta Regiomontani factione magnus Vieta ſuam tripleurorum obliquangulorum doctrinam efformavit, quæ ut ſit jucunda & elegans, at non potuit iſtinc ullo modo diviſionis moleſtiam declinare; quod nos ſecundo modo præſtitimus. Itaque ſi ea via memoriæ juvandæ cauſa ſit uſurpanda, utique etiam facilitatis cauſa diviſio fuit declinanda; ſed propter compendia proſtaphæreſeos vel primum, vel ultimum hunc modum uſurpandum cenſeo; noviſſimus certè determinationum varietate caret, & ſi quandoque ſinuum verſorum differentiæ ſint nimis exiles, uſurpentur canones majores.

IV. Idem Aliter.

Abs diviſionis opere.

Fiat enim : Ut quadratum radij, ad rectangulum quod ſit ſub ſecantibus complementi crurum anguli quæſiti; ita differentia inter ſinum verſum baſis, & ſinum verſum differentiæ crurum, ad ſinum verſum anguli oppoſiti.

Demonstratio ex antecedente eſt manifeſta : Nam cum per 18 propoſ. lib. 1. radius ſit medius proportionalis inter ſinum, & ſecan-

tem

tem complementi ejuſdem peripheriæ, erit quoque per rationum compoſitionem, ut rectangulum ſub ſinibus datarum peripheriarum, ad quadratum radij, ita quadratum radij, ad rectangulum ſub ſecantibus complementorum earundem; reliqua ſunt eadem quæ in opere & demonſtratione modi antecedentis.

Sit enim in eodem triangulo *aei*

latus *ae*. 44 gr. 43 ſcr.
ai 73 gr. 25 ſcr.
ei 71 gr. 20 ſcr. 30 ſec.

Et quæratur angulus *a*: differentia inter ſinum verſum baſis *ei*, & ſinum verſum differentiæ crurum *ae ai*, quæ eſt 28 grad. 42 ſcr. Erit 5572222, rectangulum ſub ſecantibus complementi crurum, ad radium applicatum, eſt 14829411; Atque hinc proportio

ut 10000000, ad 14829411, ita 5572222, ad 8263275 ſinum verſum anguli ad *a* quæſiti, atque inde ipſe angulus ad *a* dabitur 79 gr. 59 ſcr. 55 ſec. ut ſupra.

Quamobrem hic ſolo multiplicationis geminæ opere, hac via defungi tibi licet. Illic multiplicatione & diviſione opus eſt, ſed cum multiplicatio pura proſtaphæreſi illic abſolvatur, ſola diviſio relinquitur; Tu nunc tuo arbitratu vel hunc vel illum modum eligito, prout tuis abacis videbitur oportunum.

II. Propoſitio.

Datis angulis latera invenire.

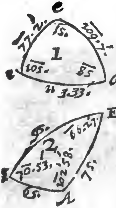
ID per enallagen παλινδρομικὴν abſolvetur: eſt enim oſtenſum lib. 3 propoſ. 8 ſi ex apicibus trianguli maximæ peripheriæ deſcribantur angulos in latera & contra mutari, hac lege, ut pro lateribus & angulis illorum reſidua ad ſemicirculum viciſſim aſſumantur.

Si igitur duo rectangula applicentur ad ſinum totum,

Unum quod ſit ſub ſinibus angulorum lateri quæſito adjacentium;

Alterum quod ſub ſinibus complementorum eorundem.

Et erit, Ut primus quotus, ad ſecundum plus vel minus ſinu complementi anguli tertij; Ita ſinus Totus, ad ſinum complementi lateris huic tertio oppoſiti.



Totum hoc inquam ex antecedente propoſitione eſt derivatum, ſecundum laterum & angulorum oppoſitorum enallagen, quam ſupra propoſ. 8 lib. 3. demonſtravimus: Nam ex datis angulis tripleuri *aei*, *a* 85 grad. *e* 115 gr. *i* 105 gr. efformatur ſecundum AEI, cujus latera angulis oppoſita æquentur illorum angulis deinceps (ut loquuntur) ſive illorum ad ſemicirculum reſiduis æqualia ſint, ut ex illius angulo *a*, 85 gr. datur

tur hujus latus EI 95 gr. ex illius *e* 115 grad. datur hujus latus AI 65 gr. ex illius *i* 105 gr. datur hujus latus AE 75 gr. datis autem lateribus AEI dantur per antecedentem quoque anguli, ſed latera illius primi, hujus ſecundi, oppoſitis deinceps angulis ſunt æqualia: nempe quemadmodum latus AE 75 gr. in ſecundo, illius *i* anguli in primo reſiduum eſt ad ſemicirculum; ita hujus ſecundi angulus I 70 gr. 53 ſcr. illius lateris *ae* reſiduum quoque eſt ad ſemicirculum; ſecundum has leges itaque noſtræ ſolutionis formula eſt expreſſa: Cum enim angulorum ad ſemicirculum reſidua fiant latera ſecundi trianguli; & ſecundi angulorum reſidua ad ſemicirculum latera primi; & horum ſinus & ſinus complementorum ijdem ſint: in ipſa factione nihil erit variandum; ſed quod in antecedente problemate dabat angulum quadrante majorem, id hic dat latus quadrante minus, illius nempe reſiduum ad ſemicirculum. Horum itaque caſuum determinationes, ſecundum quas laterum ſpecies, & an ſumma vel differentia quoti ſecundi, & ſinus complementi aſſumenda ſit hic ſigillatim & diſtincte proponemus.

Casvvm Determinatio.

Πτώσεων διορισμός.

Sumetur autem ſumma.

Si anguli quæſito lateri adjacentes ſint *affectionis eiuſdem*, & tertius quærendo oppoſitus *quadrante minor*, latus quod quæritur quadrante minus eſt.

Si anguli quæſito lateri adjacentes ſint *affectionis*

nis diverſæ, & tertius quærendo lateri oppoſitus *quadrante maior*, latus quod quæritur quadrante majus eſt.

At contra aſſumetur differentia,

At ſi anguli quæſito lateri adjacentes ſint *affectionis eiuſdem*, & tertius quærendo oppoſitus *quadrante maior*, ſi hoc caſu quotus primus ſecundo cedat, latus quod quæritur quadrante majus erit; ſi præſtet minus.

Si anguli quæſito lateri adjacentes ſint *affectionis diverſæ*, & angulus tertius quærendo lateri oppoſitus *quadrante minor*; ſi hoc caſu quotus primus ſecundo cedat, latus quod quæritur quadrante minus erit; ſi præſtet, majus.

Sed exemplis propoſitis hujus theorematis uſum illuſtrare oportunum erit. Sit itaque propoſitum tripleurum *aei*, cujus angulus *a* ſit 85 gr. *e* 115 gr. *i* 105 gr. & quæratur primum latus *ei*: ambo autem hi quoti per puram proſtaphæreſin inveniri poſſunt abſque opere multiplicationis, per prop. 31 lib. 3. cujus factionis typum hic ſubjeci

a 85.	5
e 115. ſeu 65.	25
compl. *a*. 5	85
70. 9396926	110. 9396926
60. 8660254	60. 8660254
18057180	736672
1. quotus. 9028590	2 quot. 368336
	2588190 ſin. cō. *i*
1 quotus 3	2956526. invētū 3.

9028590 2956526 ita 10000000 ad 3274526 qui eſt ſinus complementi lateris *ae*, cui cedunt 19 gr. 6 ſcr. $52\frac{1}{2}$ ſec. & cum per determinationem primam

mam latus *ae* ſit quadrante majus, erit itaque 109 gr. 6 ſcr. 51½ ſec.

Hac via invenietur *ai* 113 gr. 33 ſcr. 27½ ſec. Et *ei* 77 gr. 1 ſcr. 34½ ſec.

II. IDEM ALITER.

Hic modus adhibita laterum & angulorum enallage, per propoſ. 8. lib. 3, & quia complementa majoribus & minoribus; peripherijs ſunt communia ex ſecunda factione propoſitionis præmiſſæ hoc modo derivabitur, ut prius.

Si duo rectangula applicentur ad radium, unum quod ſit ſub tangente complementi anguli primi quæſito lateri adjacentis, & ſinu complementi anguli ſecundi eidem adiacentis;

Alterum quod fit ſub ſecante complementi anguli primi, & ſinu complementi anguli oppoſiti;

Et erit, Ut ſinus totus, ad ſecantem complementi anguli ſecundi: Ita quotorum inventorum ſumma vel differentia, ad ſinum complementi lateris quæſiti.

Caſuum determinatio, & ratio eſt eadem, quæ modo antecedente expreſſa eſt; eas igitur iſtinc repetito.



Propoſitum itaque ſit tripleurum *aei*, cujus angulus *a* 85 gr. *e* 115 gr. *i* 105 gr. Et quæratur primum latus *ei*, oppoſitum angulo ad *a*. Ex adjacentibus *e*, *i*, aſſumatur nunc *e* tanquam primus, *i* ſecundus

1. *e*. 115 gr. tan. co. 466307.	hujus ſec. c. 11033779
2. *i* 75 gr. ſin. co. 2588190.	ſin. compl. *a* 871557
invent. 1. 1206893	invent. 2. 961657.

Et quia hoc exemplum pertinet ad determinationē caſus primi, ſumatur utriuſque ſumma 2168550, & latus

& latus *ei* angulo tertio *a* oppoſitum erit quadrante minus, hinc ſecans compl. anguli ſecundi *i* eſt 10352762. unde proportio.

ſec.com.*i*.	proſt.quot.	ſin.cõ.lat.*ei*	
10000000	10352762,	2168550	2245048.

qui eſt ſinus complementi lateris *ei*, cui cedunt 12 gr. 58 ſcr. 25½. & ipſum ideo latus *ei* quadrante minus 77 gr. 1 ſcr. 24½ ſec.

Quæratur in eodem triangulo latus *ae*, oppoſitum angulo *i* 105 gr. Et ſit ex adjacentibus *a* primus, *e* ſecundus.

1. *a*. 85 gr. tan. cõ. 874887.	ejuſ. ſec. cõ. 10038198
2. *e*. 115 gr. ſin. cõ. 4226183	ſin. c. *i* 105 gr. 2588190
quotus 1. 369743	quotus 2. 2598076

Et quia hoc exemplum pertinet ad caſum ſecundum, aſſumatur horum quotorũ ſumma, 2967819. & latus *ae* erit quadrante majus: porrò ſecans compl. anguli ſecundi *e*, eſt 11033779. atque hinc proportio.

ſec.com.*e*	proſt.quot.	ſin.cõ.lat.*ae*	
10000000.	11033779.	2967819.	3274627.

qui eſt ſinus compl. lateris *ae*, cui cedunt 19 gr. 6 ſcr. 53½ ſec. & ideo ipſum *ae* latus quadrante majus 109 gr. 6 ſcr. 53½ ſec.

Hac via invenies latus *ai* 113 gr. 33 ſcr. 27½ ſec.

Sed eſto quoque etiam alterum tripleurum ad ſequentium caſuum varietatem oportunum: ſitque in tripleuro *aei* angulus *a* 85 gr. *e* 115 gr. & *i* 75 gr. & quæratur primo latus *ae* oppoſitum angulo tertio *i*, ſtatuatur itaque *a* tanquam adjacentium terminus primus, *e* ſecundus.

1. *a* 85 gr. tan. cõ. 874887.	ejuſ. ſec. cõ. 10038198.
2. *e* 115 gr. ſin. cõ. 4226183.	ſin. c. *i* 75 gr. 2588910.
quotus 1. 369743.	quotus 2. 2598076.

Et

Et quia hoc exemplum pertinet ad caſus quarti determinationem, aſſumenda erit horum quotorum differentia 2228333, præterea quia quotus primus ſecundo cedit, latus quæſitum erit quadrante minus. porrò ſecans compl. anguli ſecundi *e* eſt 10352762 atque hinc proportio

ſec.com.*e*. proſt.quot. ſin.cō.lat.*ae*.
10000000. 10352762. 245236. 253887. cui debentur 14 gr. 14 ſcr. ejus complementum 75 gr. 46 ſcr. pro latere *ae*, quia hoc quadranti cedit.

Similiter per ejuſdem 4 caſus determinationem invenietur latus *ei*, 91 gr. 17 ſcr. 17 ſec.

Denique ſecundum tertij caſus leges etiam latus *ai* oppoſitum maximo angulo 115 gr. ſit enim primus adjacentium *a*, & *i* ſecundus.

1. *a* 85 gr. tan. com. 8748887,	ejuſ. ſec. cō. 10038199
2. *i* 75 gr. ſin. com. 2588190	ſin. c. *e* 115 gr. 4226183
quotus 1. 226437	quotus 2. 4242326

Et quia hoc exemplum pertinet ad determinationem caſus 3, ſumatur horum quotorum differentia 4015890, & latus quæſitum erit quadrante majus, ſecans compl. anguli ſecundi *i* eſt 10352762. atque hinc proportio

ſec.com.*i* proſt.quot. ſin.cō.lat.*ai*,
10000000. 10352762. 4015890. 4157554. cui cedunt 24 gr. 35 ſcr. ergo latus *ai* majus quadrante erit 114 gr. 35 ſcr. Atque ita hujus noſtræ factionis, & determinationum ejus varietatem, ſolo multiplicationis calculo expedivimus.

III. IDEM

III. IDEM ALITER
Per ſinus verſos.

Vt rectangulum ſub ſinibus angulorum duorum, per ſinum totum diviſum, ad ſinum totum; ita differentia inter ſinum verſum reſidui ad ſemicirculum anguli tertij, & ſinum verſum differentiæ illorum, ad ſinum verſum reſidui eius lateris quod tertio angulo opponitur.

CAVSA eadem eſt quæ prius: cum enim, ex datis poſſit conſtrui triangulum, cujus latera & anguli huic dato ſint ad ſemicirculi reſiduum æqualia per propoſitionem 8 lib. 3. ergo per 3 modum propoſ. antecedentis, hic quartus proportionalis eſſet ſinus verſus, reſidui lateris hujus quæſiti ad ſemicirculum; eo igitur deducto de diametro relinquitur ſinus verſus ipſius lateris.

Sit enim in eodem tripleuro *aei*, angulus *a* 65 gr. o ſcr. *e* 75 gr. o ſcr. *i* 85 gr. o ſcr. & quæratur latus *ai*. rectangulum ſub ſinibus, *a* 65 gr. 9063078, & *i* 85 grad. 9961947, ad radium applicatum erit 9028590. Sed hunc eundem terminum per proſthaphæreſin ſimplicem inveniri poſſe jam ſupra monui: differentia 65 & 85 gr. ſunt 20 gr. cujus ſinus verſus 603074: ſinus verſus reſidui anguli tertij ad ſemicirculũ nempe 105 gr. eſt 12588190, horum ſinuum verſorum differentia eſt 11985116: Fiat itaq; ut 9028590 ad ſinum totum 10000000; ita 11985116 ad quartum 13274626, cujus à diametro differentia 6725374 minor radio, arguit latus quæſitum *ai* quadrante minus eſſe, & cedent ei 70 gr. 53 ſcr. $6\frac{1}{2}$ ſec. Eodem modo invenies latus

latus *ae* 77 gr. 1 ſcr. $34\frac{1}{2}$ ſec. Et latus *ci* 62 grad. 26 ſcr. $32\frac{1}{2}$ ſec.

Sed etiam alterum nobis exemplum propoſitum eſto, angulus *a* 65 gr. 26 ſcr. *e* 88 gr. 32 ſcr. 43 ſec. *i* 104 gr. 14 ſcr. & quæratur latus *ae*; rectangulum ſub ſinibus angulorum adjacentium, *a* 65 gr. 26 ſcr. & *e* 88 gr. 32 ſcr. 43. ſec. ad radium applicatum, per puram proſtaphæreſin invenitur 9091850, differentia eorundem angulorum eſt 23 gr. 6 ſcr. 43 ſec. cujus ſinus verſus eſt 802603: ſinus autem verſus reſidui ad ſemicirculum anguli tertij *i* 104 gr. 14 ſcr. nempe 75 grad. 46 ſcr. eſt 7541311, horum ſinuum verſorum differentia eſt 6738708. Hinc proportio; quemadmodum 9091850, ad ſinum totum 10000000; ita differentia dictorum ſinuum verſorum, 6738708, ad ſinum verſum 7411811, qui de radio deductus relinquit 2588189 ſinum 15 gr. cujus complemento 75 grad. ille ſinus verſus debetur; hujus itaque reſiduum ad ſemicirculum 105 gr. eſt ipſum latus *ae* quæſitum, quod angulo tertio opponitur.

Hunc igitur modum & generaliter & ſimpliciſſimè abſque ulla circuitione expreſſimus, ex legitimè inſtituta noſtra angulorum & laterum mutua enallage; quam ſupra propoſ. 8 lib. 3 à magnis viris non ſatis purè tractatam planiſſimè oſtendimus.

IV. IDEM ALITER.

Abſque opere diviſionis.

Quemadmodum ſinus totus, ad rectangulum quod fit ſub ſecantibus complementi angulorum duorum

 ad radium

ad radium applicatum: Ita differentia inter ſinum verſum reſidui ac ſemicirculum anguli tertij, & ſinum verſum differentiæ illorum; ad ſinum verſum reſidui eius lateris quod tertio opponitur.

HOc plane è quarto modo antecedentis factionis ita eſt expreſſum, ut antecedens è tertio illius, itaque hic lectorem longis logis morari non eſt animus:

Exemplum autem tale eſto. Sit enim in eodem tripleuro *aei*

a 65 gr. 26 ſcr.

e 88 gr. 32 ſcr. 43 ſec.

i 104 gr. 14 ſcr. & quæratur latus *ae*. rectangulum ſub ſecantibus compl. angulorum *a* & *e* nempe 10995316 & 10003224 eſt 10998861, differentia eorundem angulorum eſt 23 grad. 6 ſcr. 43 ſec. cujus ſinus verſus 802604: ſinus porro verſus reſidui ad ſemicirculum anguli tertij eſt 7541311, horum differentia itaque fuerit 6738708. Atque hinc demum proportio. ut 10000000 ad 10998861, ita 638708 ad 7411811 ſinum verſum reſidui ad ſemicirculum lateris *ae*, quare ipſum latus majus eſt quadrante; ſinus autem verſus de radio ſubductus relinquit 2588189 ſinum complementi, cui cedunt 15 gr. ij hoc caſu ad quadrantem additi conflabunt latus *ae* quæſiſitum 105 gr. o ſcr. ut ſupra.

III. PRO-

III. PROPOSITIO.

Datis lateribus duobus, & angulo ab ijs comprehenſo, reliquum latus invenire.

DUo rectangula ſigillatim ad ſinum totum applicentur. Unum quod ſit ſub ſinibus laterum datorum;

Alterum quod ſit ſub ſinibus complementorum eorundem.

Et erit ut ſinus totus, ad ſinum complementi anguli à datis lateribus comprehenſi, ita quotus primus ad quartum. Huius inventi & quoti ſecundi ſumma vel differentia erit ſinus complementi lateris dato angulo oppoſiti.

CASVVM DETERMINATIO.

Πτώσεων διορισμός.

Sumetur autem ſumma.

Cum latera erunt *affectionis eiuſdem*, & angulus ab ijs comprehenſus *acutus*, & hoc caſu latus quæſitum eſt quadrante minus.

Vel, cum latera erunt *affectionis diverſæ*, & angulus ab ijs comprehenſus *obtuſus*, & hoc caſu latus quæſitum erit quadrante majus.

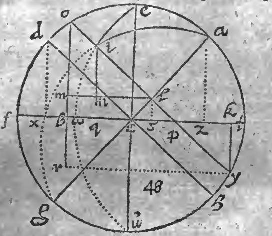
At contra ſumetur differentia.

Cum latera erunt *affectionis eiuſdem*, & angulus ab ijs comprehenſus *obtuſus*; & ſi hoc caſu quotus ſecundus cedat tertio, latus quod quæritur erit quadrante majus; ſi præſtet minus.

Vel, cum latera erunt *affectionis diverſæ*, & angulus ab ijs comprehenſus *acutus*, ſi hoc caſu quotus ſecundus cedat tertio latus quod quæritur quadrante minus eſt; ſi præſtet majus.

Quod ſi nulla intercedat differentia, latus quæſitum quadranti æquale erit.

Repetatur diagramma primum propoſitionis primæ. Et in tripleuro *aei*, dētur latera *ae*, *ai*, cum angulo *eai* ab iiſdem cōprehenſo, & quæratur latus huic oppoſitum *ei*; linearū porrò omniū



eſto eadem notio quæ ibi à nobis expoſita eſt: cum itaque *ol* ſit radius paralleli, crure *ai* vel *ao* deſcripti, & *il* ſinus complementi anguli *eai*, in parallelo *oy*. Erit igitur primo ob ſimilitudinem triangulorum *cdx*, *lom*, ut *cd* ad *dx*, ſinum lateris *ae* vel *df*, ita *ol* ſinus lateris *ai*, ad ipſam *om*: hoc eſto inventum primum. Porrò cum ex ſimilitudine triangulorum *caz*, *cls*, inveniatur *ls*, nempe ut ſinus totus, ad *az* ſinum complementi lateris ſecundi *ae*, ita *cl* ſinus complementi *ao* vel *ai* lateris primi, ad *ls* vel *nq*: hoc eſto inventum ſecundum.

Et denique ut *ol* ad *li*, hoc eſt ut ſinus totus ad ſinum complementi anguli dati *eai*, ita *om* inventum primum, ad *in*: hujus *in* & inventi ſecundi *nq* ſumma,

ma, hoc loco conflat *iq* ſinum complementi lateris quæſiti *ei*.

Si *i* caderet in *l*, tum inventum ſecundum & tertium æquarentur, & angulus eſſet rectus. Si ultra *l* inter *l* & *p*, jam aſſumenda eſſet ſecundi & tertij inventi differentia; ſi ultra etiam *p*, rurſum ſumma; atque ita leges ſuæ ſibi ſunt, ſi *ai* latus majus ſit quadrante; quod facile ex ſchematis inſpectione notari poteſt. Verum quia mentis acies non ſemper æquè eſt ſerena, neque demonſtrationis vis perinde oculis & animo obverſatur factionem ipſam & caſus earum ac determinationes hic diſtinctè, & ordine proponemns.

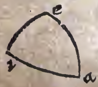
Totum hoc opus unica multiplicatione abſolvitur; quia primus & ſecundus quotus, ſola proſtaphæreſi inveniuntur; ſed exempla nunc ſubjicio.

Sit itaque in tripleuro *aei*, latus *ae* 65 gr. *ai* 95 gr. & angulus *eai* 104 gr. 14 ſcr.

ai 95. ſeu 85.
ae 65.
compl. 5

70. 9396926 — 9396926
60. 8660254 — 8660254
18057180 — 736672
1. 9028590. — 2 368336
ſin. com. *eai* — 1 quot.

10000000, 2458713, 9028590, 2219871.



Et qnia hoc exemplum pertinet ad caſum ſecundum, hujus & quoti 2 ſumma eſt aſſumenda, nempe 2588207, qui eſt ſinus compl. lateris quæſiti *ei*, quod quadrante majus eſt: debentur autem huic ſinui 15 gr. 0 ſcr. & ideo latus ipſum erit 105 gr. 0 ſcr.

Detur nunc angulus *eia*. 65 gr. 26 ſcr. & latera cum comprehendentia *ei* 105 gr. 0 ſcr. *ai* 95 gr.

ei. 105. ſeu 75
ai. 95. 85
compl. 15

	100. 9848077		9848077
	70. 9396926		9396926
	19245003		451151
1.	9622501	2.	225575
	ſin. com. *eia* 1 quotus		

10000000, 4157517, 9622501, 4000571. quia hoc exemplum pertinet ad caſum primum, addatur quotus 2, ſumma erit 4226146, ſinus compl. lateris quæſiti: ipſumque latus erit quadrante minus, nempe 65 gr. 0 ſcr. ſcilicet pro *ae*.

Sit tertiò latus *ae* 75 grad. 56 ſcr. *ai* 114 grad. 34 ſcr. & angulus *eai* 85 gr. 0 ſcr. & quæratur latus *ei*.

ae 75 46
ai 114. 34. 65. 26
compl. 14 14

	79. 40. 9837808		9837808
	51. 12. 7793380		7793380
	17631188		2044428
1.	8815594.	2.	1022214.
	ſin. com. *cai* 1 quotus		

10000000, 871557, 8815594, 768323. Et quia hoc exemplum pertinet ad caſum quartum, ſumenda eſt hujus & 2 quoti differentia, quæ eſt 253891, ſinus compl. lateris quæſiti *ai*, cui cedunt 1 gr. 27 ſcr. $17\frac{1}{2}$ ſec. & quia ſecundus huic præſtat, latus quæſitum quadrante majus eſt, 91 gr. 27 ſcr. $17\frac{1}{2}$ ſec. Hic modus facilis eſt & elegans, ſed

ſed quia aliis forſan magis placebit, ut in fine ſeu proportione ultima, nihil amplius operis ſuperſit, quia id facile excidit, tentabimus quoque ex eodem diagrammate

II. IDEM ALITER.

Duo rectangula ſigillatim applicentur ad ſinum totum.

VNum quod ſit ſub ſinu lateris dati primi, & ſinu complementi anguli dati:

Alterum quod ſit ſub ſinu complementi lateris primi, & tangente complementi lateris ſecundi:

Et erit, Ut ſinus totus, ad ſinum lateris ſecundi; ita quoti primi & ſecundi ſumma vel differentia, ad ſinum complementi lateris tertij dato angulo oppoſiti.

Caſuum determinatio, & reliqua, antecedenti factioni ſunt ſimilia.

CASVVM DETERMINATIO.

Πτώσεων διορισμὸς,

Sumetur autem ſumma.

Cum latera erunt *affectionis eiuſdem*, & angulus ab ijs comprehenſus acutus, & hoc caſu latus tertium dato angulo oppoſitum quadrante minus erit.

Vel, cum latera erunt *affectionis diverſæ*, & angulus ab iis comprehenſus obtuſus, & hoc caſu latus tertium dato angulo oppoſitum erit quadrante majus.

At contra ſumetur differentia.

Cum latera erunt *affectionis eiuſdem*, & angulus ab ijs comprehenſus obtuſus, & ſi hoc caſu quotus primus ſecundo cedat, latus tertium dato angulo oppoſitum quadrante minus eſt; ſi præſtet majus.

Vel, Cum latera erunt *affectionis diverſæ*, & angulus ab ijs comprehenſus acutus, & ſi hoc caſu quotus primus ſecundo cedat, latus tertium dato angulo oppoſitum quadrante majus eſt; ſi præſtet minus.

Quod ſi nulla differentia intercedat, indicium eſt latus quæſitum quadranti æquari.

Demonſtratio è ſuperiore diagrammate primo manifeſta eſt: Ut enim ſinus totus, ad complementum dati anguli *eai*, ita *ol* ſinus lateris *ao* vel *ai*, ad *il*; & hoc eſt inventum primum. Inde ut ſinus totus, ad tangentem complementi *ac*, ſeu tangentem peripheriæ *ai*; ita *cl* ſinus complementi *ao*, ad *lp*. Harum ſumma cum angulus datus *eai* eſt acutus & latera *ea ai* ſimul minora, vel ſimul quadrante majora erunt, conflant *ip*, & hic latus tertium *ei*, erit quadrante minus qui eſt caſus primus. vel etiam ut in tripleuro *iau* quando latera *ia*, *au* ſunt affectionis diverſæ, & angulus *iau* obtuſus, & hic *iu* latus tertium erit quadrante majus; qui eſt caſus ſecundus; reliqui facile ad eandem analogiam poſito diagrammate explicari poſſunt.

Eſto igitur in tripleuro *eai*, latus primum *ai* 73 gr. 25 ſcr. & ſecundum *ae* 44 gr. 43 ſcr. & angulus ab ijs comprehenſus *eai* 79 gr. 59 ſcr. 55 ſec. & quæratur tertium latus *ei*. Hic prima applicatio pura proſtaphæreſi poteſt abſolvi hoc modo

gr. ſcr.

gr. ſcr. ſec.
ai 73 25
compl. ang. *a*. 10 0 5
16 35
26 35 5. 4475207.
6 34 55. 1146747.
3328460
1. 1664230.

tã.c.*ae* 44 g.43 ſc. ſi.c.*ai* 73 g.25 ſc. *lp*
10000000 9901584 2854096 2882464. 2.

Et quia hoc exemplum pertinet ad caſum primum, ſumatur hujus utriuſque inventi 1 & 2 ſumma, 4546694, & latus quæſitum erit quadrante minus. Fiat itaque ad extremum,

ſi.*ae* 44 gr.43 ſc. proſtaph.
10000000 7036014 4546694 3199c60,
hic eſt ſinus comp. lateris quæſiti *ei*, cui cedunt 18 gr. 39 ſcr. 26 ſec. & ipſum latus *ei* ideo quadrante minus, 71 gr. 20 ſcr. 34 ſec.

Eſto etiam alterum exemplum, ſitque latus primũ *ai* 95 gr. ſecundum *ae* 65 gr. & angulus *iae* 104 gr. 14 ſcr. & quæratur latus *ei*: primus quotus ſola pura proſtaphæreſi invenietur ut prius, hoc modo,

ai. 95. id eſt 85.
compl. ang. *a* 14. 14.
5 0
19 14. 3294160
9 14. 1604554
4898714
1. 2449357

tan.com.*ae* ſin.com.*ai*
10000000, 10099394, 2854096, 406414, 2.

Et quia exemplum hoc pertinet ad caſum ſecundum, aſſumenda eſt utriuſque inventi ſumma 2855771, Et latus quæſitum erit quadrante majus. Fiat itaque ad extremum ut

ſin. *ea* proſtaph.

10000000 ad 9063077, ita 2855771, ad 2588207, ſinum complementi lateris tertij *ei*, cui cedunt 15 gr. itaque ipſum latus *ei* erit exactè 105 gr. quemadmodum oportuit.

Potuimus etiam aliter atque aliter hos modos variare, ſed hoc ſatis nunc eſto, utrâque enim hac factione tantummodo facilitatem cõſectati ſumus. Sed hùc aggregetur quoque modus per ſinus verſos è Regiomontano expreſſus,

III. IDEM ALITER.

Per ſinus verſos.

Vt ſinus totus, ad rectangulum quod fit ſub crurum ſinibus, ad ſinum totum applicatum; ita ſinus verſus anguli ab ijs comprehenſi, ad differentiam inter ſinum verſum baſis, & ſinum verſum differentiæ crurum. Ea igitur ad ſinum verſum differentiæ crurum addita, dabit ſinum verſum baſis.

SECVNDVS verò in hac proportione terminus, ſola pura proſtaphæreſi inveniri poteſt.

Hujus veritas demonſtrata eſt ſupra, propoſitionis primæ modo 3, itaque hic breviores erimus, & poſito exemplo, factionis modum oſtendemus.

Sit enim in tripleuro ſecundo primi modi *aei*, latus *ae* 44 gr. 43 ſcr. *ai* 73 gr. 25 ſcr. & angulus ab ijs comprehenſus *eai* 79 gr. 59 ſcr. 55 ſec. & quæratur latus tertium *ei*.

gr. ſcr.

	ae 44 43	
gr. ſcr. ſec.	*ae* 73 25	*ai* 73 25
eai. 79.59.55.	c. 45 17	*ae* 44 43
ſin. com. 1736720	18 42. 8771462	dif. 28. 42.
10000000	28 8. 4715250	ſin. c. 8771462
ſin. verſ. 8263280	13486712	10000000
	6743356	ſin. v. 1228538

10000000, 6743356, 8263280, 5572224
1228538
ſin. verſ. *ei*. 6800762
10000000
ſin. com. lat. *ei*. 3199238

huic cedunt 18 gr. 39 ſcr. 30 ſec. & ipſum latus *ei* igitur 71 gr. 20 ſcr. 30 ſec. ut ante.

Sit exemplum alterum, & ſit *ae* 73 gr. 25 ſcr. *ai* 135 gr. 17 ſcr. & angulus ab ijs comprehenſus *eai* 100 gr. 0 ſcr. 5 ſec. & quæratur latus eidem oppoſitum *ei*,

eai. 100 gr. 0 ſcr. 5 ſec.	*ai* 135. 17 id eſt	
ſin. com. 1736720.	44 43	*ai* 135. 17
10000000.	*ae* 73. 25	*ae* 73. 25
ſin. verſ. 11736720	cō. 45 17	diff. 61 52
	118. 42. 8771462	ſi. c. 4715250
	28 8. 4715250	10000000
	13486712	ſi. v. 5284750
	6743356	

10000000, 6743356, 11736720, 7914488,
5284750
ſin. verſ. *ei* 13199238
ſin. com. l. *ei* 3199238

huic cedunt ut ante 18 gr. 39 ſcr. 30 ſec. & cum ſinus verſus major ſit radio, latus *ei* erit quadrante

majus

majus, nempe 108 gr. 39 ſcr. 30 ſec. ita enim ſupra aſſumpſeramus.

Maurolyci modus, quem ex ſphæræ inſpectione depromſit, etſi operoſior, tamen ſemper eſt in promptu, & per planorum triangulorum doctrinam abſolvi poteſt.

IV. Propositio.

Datis duobus tripleuri angulis, & latere quod utrique eorum adiacet, angulum reliquum invenire.

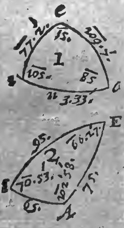
Duo *rectangula ſigillatim applicentur ad ſinum totum.*

Unum, quod ſit ſub ſinibus datorum angulorum.

Alterum quod ſit ſub ſinibus complementorum eorundem.

Et erit, Ut ſinus totus, ad ſinum complementi lateris adjacentis; Ita primus quotus ad terminum quartum.

Huius quarti & quoti ſecundi ſumma, vel differentia, erit ſinus complementi anguli quæſiti.



Hujus ſolutio ex antecedente tertia propoſitione, non ſecus, atque ſecundæ è prima propoſitione, per eandem laterum & angulorum enallagen legittimā ſecundum præcepta 8 prop. lib. 3 derivatur. Ut ſi in primo tripleuro dentur anguli *a* 85 gr. *i* 105 grad. & latus commune *ai* 113 grad. 33 ſcr. per hanc enallagen intelliges in ſecundo AEI, dari pro *a* latus EI 95 grad. pro angulo

angulo primi *i* latus AE 75, & pro latere illo *ai*, hic angulum E, qui termini, illorum ſunt ad ſemicirculum reſidua. Atqui ſecundum iſtas leges hæc præcepti formula à nobis eſt expreſſa; vide demonſtrationis analogiam quam propoſitione ſecunda ſecuti ſumus, neque quidquam præterea verborum hic deſiderabis.

Atque hic uterque quotus ſola & pura proſtaphæreſi inveniri poteſt.

Sed caſuum determinationes hic ſunt inverſæ, quas ideo hic ſigillatim explicamus.

CASVVM DETERMINATIO.

Πτώσεων διορισμός.

Sumetur autem ſumma.

CUM anguli dati erunt *affectionis eiuſdem*, & latus ijs adjacens *maius quadrante*; hoc caſu angulus tertius dato lateri oppoſitus erit obtuſus.

Vel, cum anguli erunt *affectionis diverſæ*, & latus adjacens *minus quadrante*; & hoc caſu angulus tertius dato lateri oppoſitus erit acutus.

At contra ſumetur differentia.

Cum anguli erunt *affectionis eiuſdem*, & latus adjacens *minus quadrante*, & ſi hoc caſu quotus primus ſecundo cedat angulus tertius dato lateri oppoſitus eſt obtuſus; ſi præſtet, acutus.

Vel, cum anguli erunt *affectionis diverſæ*, & latus adjacens *maius quadrante*, & ſi hoc caſu quotus primus ſecundo cedat, angulus tertius dato lateri oppoſitus eſt acutus; ſi præſtet, obtuſus.

Quod

Fiat itaque, ut

ſin.co.*ai* quot. 1.

10000000, 871557, 8815594, 768329, & quia hoc exemplum pertinet ad caſum quartum, hujus quarti proportionalis, & quoti ſeu inventi ſecundi differentia, nempe 253885 erit ſinus compl. anguli quæſiti ad *e*, qui jam eſt acutus; cedunt autem huic ſinui 1 gr. 27 ſcr. 17 ſec. quare angulus *e* dato lateri oppoſitus erit 88 gr. 32 ſcr. 43 ſec.

II. IDEM ALITER.

Duo rectangula applicentur ad ſinum totum.

VNum quod ſit ſub ſinu anguli primi dati, & ſinu complementi lateris dati.

Alterum quod ſit ſub ſinu complementi anguli primi dati, & tangente complementi anguli ſecundi.

Et erit, Ut ſinus totus, ad ſinum anguli ſecundi, ita quoti primi & ſecundi ſumma vel differentia, ad ſinum complementi anguli tertij, qui dato lateri opponitur.

Hujus quoque demonſtratio ex antecedentis propoſitionis modo ſecundo, per laterum & angulorum enallagen manifeſta eſt; Caſuum autem determinationes inverſo modo ijs reſpondent, quas eam ob cauſam hic quoque ſeorſim proponere eſt neceſſe.

Atque hic primus duntaxat quotus ſemper ſola pura proſtaphæreſi invenitur.

CASVVM DETERMINATIO.

Πτώσεων διορισμὸς.

Sumetur autem ſumma.

CUM anguli dati erunt *affectionis eiuſdem*, & latus iis adjacens majus quadrante; & hoc caſu angulus tertius dato lateri oppoſitus erit obtuſus.

Vel, cum anguli erunt *affectionis diverſæ*, & latus adjacens minus quadrante; & hoc caſu angulus quæſitus dato lateri oppoſitus erit acutus.

At contra ſumetur differentia.

Cum anguli dati erunt *affectionis eiuſdem*, & latus ijs adjacens minus quadrante, & ſi hoc caſu quotus primus ſecundo cedat, angulus tertius dato lateri oppoſitus eſt obtuſus; ſi præſtet, acutus.

Vel, cum anguli dati erunt *affectionis diverſæ*, & latus adjacens majus quadrante, & ſi hoc caſu quotus primus ſecundo cedat, angulus tertius dato lateri oppoſitus eſt acutus; ſi præſtet obtuſus.

Quod ſi nulla intercedat differentia, argumento erit angulum tertium dato lateri oppoſitum eſſe rectum.

Sit enim in præmiſſo diagrammate angulus *a* 65 grad. 26 ſcr. *e*. 88 grad. 32 ſcr. 43 ſec. & latus utrique adjacens *ae* 105 grad. quæratur autem angulus tertius *i*, ſitque *a* hic nobis angulus primus *e* ſecundus.

1. *a*. 65

1. *a*. 65 26	1 ſin.compl. *a* 4157517.
comp.*ae*.15	2.tan.compl.*e* 253951
24 34.	2. 105580.5599667
39 34. 6369756	
9 34. 1661951	
4707805	
1. 2353902.	
2. 105580.	
ſumma. 2459482	

Et quia hoc exemplum pertinet ad caſum primum ſumatur inventi primi & ſecundi ſumma 2459482. & angulus quæſitus erit obtuſus.

	ſin. *e*	proſtaph.	
10000000	9996777,	2459482,	2458689.

hic eſt ſinus complem. anguli quæſiti *i*, cui cedunt 14 gr. 14 ſcr. & ideo ipſe angulus erit 104 gr. 14 ſcr. ut ſupra à nobis eſt conſtitutus.

Eſto exemplum ſecundum in eodem triangulo. Sitque jam primus *a* 65 gr. 26 ſcr. ſecundus *i* 104 gr. 14 ſcr. & *ai* latus adjacens 95 gr. o ſcr. & quæratur angulus *e*

1. *a*. 65 26	1. ſin.com.*a*.4157517.
compl. *ai*. 5	2. tan.com.*i*. 2536580
24 34	2. 1054587.4471880
29 34. 4934359	
19 34. 3349034.	
1585325.	
1. 792662.	
2. 1054587	
differentia. 261925	

Et quia hoc exemplum pertinet ad caſum quartum,

O ſumatur

ſumatur differentia inventi primi & ſecundi 261-925, & angulus quæſitus erit acutus.

ſin. ang.*i* proſtaph.

10000000, 9693025, 261925, 253884, hic eſt ſinus compl. anguli quæſiti ad *e*; debentur autem huic ſinui 14 gr. 14 ſcr. quare ipſe angulus *e* fuerit 104 gr. 14 ſcr. major recto, ut ſupra fuerat propoſitus.

III. IDEM ALITER,

Per ſinus verſos.

VT ſinus totus, ad rectangulum quod ſit ſub angulorum ſinibus ad ſinum totum applicatum; ita ſinus verſus communis lateris dati ad ſemicirculum reſidui, ad differentiam inter ſinum verſum anguli tertij ad ſemicirculum reſidui, & ſinum verſum differentiæ datorum.

Is igitur ad ſinum verſum differentiæ datorum angulorum additus, dabit ſinum verſum reſidui tertij, hoc igitur reſiduum; de ſemicirculo ſubductum relinquet tertium qui quærebatur.

Hoc totum ſecundum enallagen laterum & angulorum, è tertio modo antecedentis propoſitionis eſt derivatum, ut ambo præmiſſi è ſuis reſpondentibus. itaque ſi modo adhibita enallage rem inſpexeris, omnia erunt plana, ut verbis ad hanc rem pluribus opus non ſit.

Hic ut ante terminus ſecundus, nempe rectangulum ſub angulorum ſinibus comprehenſum, ſola & pura proſtaphæreſi invenitur.

Exemplum tale eſto. Sit *a* 65 gr. 26 ſcr. *e* 88 gr. 32 ſcr. 43 ſec. & latus utrique adjacens *ae* 105 gr. atque

atque quæratur tertius ang. *i* dato lateri oppoſitus.

a 65 26
e 88 32 43.

23. 6. 43. diff.	*a*. 65 26
66 53 17 compl.	*e*. 88 32 43
9197397 ejus ſin.	24 34
10000000	113 6 43 9197397
802603 ſin.c. diff.an.	63 58 43 8986303
	18183700
	9091850

ae 105
reſid. 75
compl. 15.ſin. 2588190
10000000
ſin.verſ. reſid. 7411810

Hinc jam proportio,

ut ſin. tot. ad rect.*a* ſin.cr. ita ſin.verſ. ad
10000000, 9091850, 7411810, 6738708,

Hic igitur quartus additus ad ſinum verſum differentiæ angulorum *a* & *e*, nempe 802603, conflabit ſinum verſum 7541311, qui ideo de radio deductus, dabit ſinum complementi 2458689 cui cedunt 14 gr. 14 ſcr. ipſa ergo peripheria cui ille ſinus verſus debetur eſt 75 grad. 46 ſcr. cujus reſiduum ad ſemicirculum 104 gr. 14 ſcr. eſt quantitas anguli tertij ad *i*.

V. PROPOSITIO.

Datis tripleuri lateribus duobus & angulo ab ipſis comprehenſo reliquos angulos invenire.

ENIMVERO *ſi tria rectangula applicentur ad ſinum totum,*

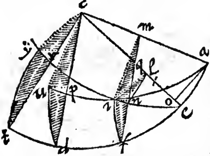
Vnum quod ſit ſub ſinu lateris quæſito angulo oppoſiti in ſinum anguli dati,

Alterum quod ſit ſub ſinu lateris eiuſdem & ſinu complementi anguli dati,

Tertium quod ſit ſub ſinu complementi lateris eiuſdem, & tangente lateris adiacentis.

Et erit ut primus quotus, ad ſinum complementi lateris adjacentis, ita ſumma vel differentia ſecundi & tertij, ad tangentem complementi anguli quæſiti.

Hic autem primus & ſecundus quotus, pura proſthaphæreſi inveniri poſſunt.



Sit itaque propoſitum tripleurum *aei*, & ſunto latera *ae*, *ai*, data, cum angulo *a* ab ipſis comprehenſo, & quæratur angulus *e* oppoſitus lateri *ai*. atque in hoc quidem diagrammate commoditatis cauſa ſtatuatur angulus ille ad *e* ex hypotheſi obtuſus: hinc ex *a* tanquam polo intervallo quadrantis deſcribatur peripheria *ud*, menſura anguli *a*, & ex *e* item *yt*, menſura anguli acuti ad *e*; ſitque centrum ſphæræ *c*, unde radij ad puncta *a e d t u y* connectantur, & ſinus lateris *ai* ſit *im*, lateris *ae* ſit *ao*, anguli *a* ſit *up*, & anguli *e* ſit ſinus *yr*, qui obtuſo & acuto illi deinceps pariter communis eſt. Deinde lateri *ai* ſit æqualis peripheria *af*, & ab *f* ſit *fm* perpendicularis in *ca*, inque eam demittatur perpendicularis *in*, quæ ideo ſubjecto plano quoque erit perpendicularis, ac reliquis *yr up* parallela; eritque eam ob cauſam triangulum *cup* triangulo *min* ſimile; & ab *n* in radium

dium *ce* perpendicularis demittatur *nl*, parallela ipſi *rc*, & connectatur *il*: quare triangulum *inl*, triangulo *yrc*, quoque erit ſimile: ſed & triangula rectangula *coa cmq* ob communem angulum ad *c* ſimilia ſunt, itemque *cmq nlq* ob angulos verticales ad *q*. Hinc itaque proportio;

Et primo quidem, ut *cu* ad *up*, ita *mi* ad *in*; quæ fuit proportio ſupra in præcepto primo loco propoſita.

Deinde ut *cu* ad *cp*, ita *im* ad *mn*, quæ proportio fuit ſecunda.

Tertiò ut *co* ad *oa*, hoc eſt, ut ſinus totus, ad tangentem anguli *oca*, ſeu peripheriæ *ae*, ita *cm* ſinus complementi lateris *ai* vel *af* ad *mq*; quæ fuit proportio ſive applicatio ſuprà in præcepto tertia.

Porrò autem, hoc loco, differentia inter *mn* & *mq* eſt *nq*: aliquando autem eſt *nq* ſumma illarum.

Hinc rurſum nova proportio, quemadmodum *ca* ad *co*, ita *qn* ad *nl*, & quemadmodum *in* ad *nl*, ita ſinus totus, ad tangentem anguli *nil*, ſive *cyr*, hoc eſt tangentem complementi anguli quæſiti *e*, quamobrem per rationum compoſitionem hoc modo

ca *co* *qn* *nl*

in *nl*, ſin.tot. tan. com. *e*, erit ut rectangulum ſub *ca* ſeu ſinu toto in *in*, ad rectangulum *co* in *nl*, ita *qn* in ſinum totum, ad *nl* in tangentem complementi auguli *e*: alternis igitur rectangulis per communem altitudinem depreſſis, primo & tertio per ſinum totum, ſecundo autem & quarto per *nl*: erit ut *in* ad *co*, ita *qn* ad tangentem complem. anguli *e*: complementum enim angulo acuto, & obtuſo eidem deinceps commune eſt. Hoc eſt ut ſupra in præcepto expreſſimus; quemadmodum primus quotus *in*, ad *co* ſinum complementi lateris quæſito angulo adjacentis: ita *qn* ſecundi &

tertij quoti differentia, vel etiam ſumma, ad tangentem complementi quæſiti anguli ad *e*.

Sed horum caſuum varietatem & determinationes ita explicamus, ſecundum exemplorum inductionem.

CASVVM DETERMINATIO.

Πτώσεων διορισμός.

Sumetur autem ſumma.

CUM latus illud quæſito angulo *oppoſitum erit minus quadrante*, latus autem *adiacens, & angulus datus* fuerint *affectionis inter ſe diverſæ*; & hoc caſu angulus qui quæritur erit *acutus*.

Vel, cum latus illud quæſito *oppoſitum erit maius quadrante*, latus autem *adiacens & angulus datus fuerint affectionis eiuſdem*; & hoc caſu angulus qui quæritur erit *obtuſus*.

At contra ſumetur differentia.

Cum latus illud primum quæſito oppoſitũ, fuerit *minus quadrante*, latus verò *adiacens*, *& angulus datus* fuerint *affectionis eiuſdem*; & ſi hoc caſu *ſecundus quotus cedat tertio*, angulus qui quæritur erit *acutus*, ſin *præſtet*, *obtuſus*.

Vel, cum latus primum quæſito oppoſitum, erit *maius quadrante*, latus autem *adiacens & angulus datus* fuerint *affectionis inter ſe diverſæ*; & ſi hoc caſu *ſecundus quotus tertio cedat*, angulus qui quæritur erit *obtuſus*; ſin *præſtet acutus*.

Quod ſi nulla ſit differentia argumentum erit angulum qui quæritur eſſe rectum.

Exemplum

Exemplum tale eſto. Propoſiti tripleuri *aei* ejuſdem quod ſupra latus *ae* ſit 71 gr,20 ſcr.30 ſec. *ai* 73 gr.25 ſcr. denique angulus *a* ab ipſis comprehenſus 47 gr.0 ſcr. & quæratur angulus *e*.

Primus & ſecundus quotus, hic pura proſtaphæreſi inveniuntur.

ai 73 25	*ai* 73 25
a 47 0	compl. *a* 43
com. 16 35	16 35
63 35. 8955824	59 35 8623664
30 25. 5062846	26 25 4448957
14018670	13072621
1. 7009335	2. 6536310
tang. *ae* 71 20 30. 29614632	3. 8452300
ſin. com. *ai*. 73 25. 2854096	2. 6536310
3. 8452300	diff. 1915990

Et quia hoc exemplum pertinet ad caſum ordine tertium, ſumenda erit ſecundi & tertij quoti differentia 1915990, & quia ſecundus tertio cedit, erit angulus quæſitus ad *e acutus*.

Inſtituatur itaque proportio.

1 quotus ſin.com. *ae*

7009335. 3199240. ita 1915990 ad 874506 tangentem compl. anguli *e*. 4 gr. 59 ſcr. 52 ſec. cujus complementum 85 gr. 0 ſcr. 8 ſec. pro ipſo acuto ad *e*.

II. IDEM ALITER,

Abſque opere diviſionis.

1 ENIMVERO, *Solidum quod fit ſub ſecante compl. anguli dati, & ſecante compl. lateris quæſito oppoſiti, & ſinu complementi lateris eidem adiacentis, applicetur ad ſinus totius quadratum.*

 2 *Deinde*

2 Deinde duo rectangula ad ipſum ſinum totum, Nempe, Vnum quod ſit ſub ſinu lateris quæſito oppoſiti, in ſinum complementi anguli dati.

3 Alterum quod ſit ſub ſinu complementi lateris eiuſdem oppoſiti, & tangente lateris adjacentis.

Et erit, Vt ſinus totus, ad quotum primum, Ita ſecundi tertiique ſumma vel differentia, ad tangentem complementi anguli quæſiti.

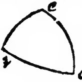
Determinationis & caſuum varietas ex modo antecedente repetantur; unde hic modus quoque derivatur; nam & proportio ſive applicatio ſecundo & tertio loco ibidem propoſita etiam hic retinetur, reliqua è prima & ultima proportione derivantur hoc modo.

Nam ut *cu* in eodem diagrammate ad *up*, ita ſecans complementi peripheriæ *ud* ſive anguli *a*, ad ſinum totum per propoſ. 18 lib. 1. porrò in priore modo, ultimo loco oſtenſum eſt, *in co qn* & tangentem compl. anguli *e* eſſe proportionales: quare ad rationum compoſitionem diſponentur hoc modo.

ſin. tot.	*up.*	ſeca. compl. *a*	ſinus tot.
in	*co*	*qn*	tang. com. *e*.

Erit igitur, ut rectangulum è ſinu toto, in *in*, ad *co* in *up*, hoc eſt quia ipſis *in* & *up* proportionales ſunt *im*, *uc*; & his ipſis per 18 prop. lib. 1. ſinus totus & ſecans compl. *ai*: erit quoque ut quadratum è ſinu toto; ad rectangulum *co* in ſecantem complementi *ai*; ita rectangulum ſub ſecante complementi anguli *a*, & ipſa *qn*, ad rectangulum ſub ſinu toto, & tangente complementi anguli quæſiti *e*. Quamobrem erit per interpretationem, ut cubus è ſinu toto, ad ſolidum ſub ſecante complem. anguli *a*, & ſecante complementi *ai*, & ſinu complementi *ae*, ita *qn*, ad tangen-

tangentem complementi anguli quæſiti ad *e*: ſi itaque primus & ſecundus terminus, ad quadratum ſinus totius applicentur, conſtabunt ſibi termini ſupra à nobis propoſiti.



Sed hic una tantum proſtaphæreſis pura datur.

Exemplum idem eſto quod prius ſitque *ai* 73 gr. 25 ſcr. *ae* 71 gr. 20 ſcr. 30 ſec. & angulus *a* 47 gr. 0 ſcr. & quæratur angulus *e*.

ſec. com. *a* 13673275
ſec. com. *ai* 10433995

14266688
ſin. com. *ae* 3199240

4564255 hinc jam proportio, ſumma vel diff.

10000000 ad 4564255 ita 1915978 ad 874502 tangentem compl. anguli quæſiti ad *e* 5 gr. 0 ſcr. 7 ſec. Cum autem hoc exemplum pertineat ad caſum tertium, anguluſque ad *e* ideo ſit acutus; dabitur nobis angulus ipſe 84 gr. 59 ſcr. 53 ſec. fere ut prius.

III. IDEM ALITER,

Et facilius.

ENIMVERO *duo rectangula applicentur ad ſinum totum, Unum quod ſit ſub ſecante complementi anguli dati & ſinu lateris angulo quæſito oppoſiti.*

Alterum quod ſit ſub ſinu complementi anguli dati & tangente complementi lateris quæſito adiacentis.

Et erit, Ut ſinus totus, ad quotum primum, ita quotus ſecundus plus vel minus tangente complementi

lateris quæſito oppoſiti, ad tangentem complementi anguli quæſiti.

Caſuum determinatio eſt ferè eadem quæ prius: ſed tamen hic nobis repetendam cenſui.

CASVVM DETERMINATIO.

Πτώσεων διορισμός.

Sumetur autem ſumma.

CVm latus quæſito oppoſitum erit *minus quadrante*, latus autem *adiacens & angulus datus* fuerint affectionis inter ſe diverſæ; & hoc caſu angulus qui quæritur erit *acutus*.

Vel, cum latus angulo quæſito oppoſitum erit *maius quadrante* latus autem *adiacens & angulus datus* fuerint *affectionis eiuſdem*, & hoc caſu angulus qui quæritur erit *obtuſus*.

At contra ſumetur differentia.

Cum latus illud angulo quæſito oppoſitum fuerit *minus quadrante*, latus verò *adiacens & angulus* datus fuerint *affectionis eiuſdem*; & ſi hoc caſu quotus ſecundus tangenti complem. lateris oppoſiti *cedat* angulus quæſitus erit *acutus*, ſin præſtet *obtuſus*.

Vel cum latus angulo quæſito oppoſitum fuerit *maius quadrante*, latus autem *adiacens & angulus* datus fuerint *affectionis inter ſe diverſæ*; & ſi hoc caſu quotus ſecundus tangenti complementi lateris oppoſiti *cedat* angulus quæſitus erit obtuſus, ſin præſtet acutus.

Eſto

Eſto idem exemplum quod ſuprà, & ſit *ae* 71 gr. 20 ſcr. 30 ſec. *ai* 73 gr. 25 ſcr. & ang. *a* 47 gr.

ſec. comp. *a*. 13673275
ſin. *ai* 9584056
Quot. prim. 13104543

ſin. com. *a*. 6819984
tan. com. *ai*. 3376710
Quot. ſec. 2302910

tang. comp. *ai* 2977962
Quot. ſec. 2302910
Differ. 675052

Ergo, ut 10000000 ad 13104543 ita 675052, ad tang. complementi ang. *e*. 884624 qui eſt paulo major quam ſuprà inventus, & cum hoc exemplum pertineat ad caſum tertium, & quotus ſec. tangenti compl. *ai* cedat, angulus ad *e* neceſſariò erit acutus.

VI. PROPOSITIO.

Dato tripleuri latere & angulis duobus adiacentibus reliqua latera invenire.

ID plane per laterum & angulorum enallagen toties nobis jam uſurpatam manifeſtum eſt, modo animum advertas. Hujus itaque leges ſecuti ex primo antecedentis propoſitionis modo hanc formulam derivamus

Enimvero ſi tria rectangula applicentur ad ſinum totum

1 *Unum quod ſit ſub ſinu anguli, quæſito lateri oppoſiti, in ſinum lateris dati.*

2 *Alterum*

2 *Alterum quod ſit ſub ſinu eiuſdem anguli, & ſinu complementi lateris dati.*

3 *Tertium quod ſit ſub ſinu compl. eiuſdem anguli, & tangente anguli reliqui.*

Et erit, Ut primus quotus ad ſinum complementi anguli quæſito lateri adjacentis, ita differentia vel ſumma ſecundi & tertij, ad tangentem complem. lateris quæſiti.

Per enallagen quidem pleurogonicen, formari debet triangulum cujus duo latera, reſpondeant reſiduis angulorum datorum, & ang. ab ijs comprehenſus reſiduo lateris dati, & tunc eaſdem leges ſequeris quas prop. antecedente exhibuimus; verum enimvero cum ſinus æque pertineant ad angulos ipſos, quam ad eorundem reſidua, utere formulâ ſuprà poſitâ.

Caſuum autem determinatio in tali triangulo prorſus eadem eſt quæ ſuprà modo animum advertas, & debitam later. & angulorum tranſmutationem inſtituas.

Exemplum ergo eſto tale,

Detur in triang. *aie*, angulus ad *a* 47 gr. ad *e* 85 gr. cum latere *ea* 71 gr. 20 ſcr. 30 ſec. & quæratur latus *ai*.
hinc formabitur aliud triang. *aei*, cujus latera *ai* & *ei* reſpondeant horum angul. reſiduis, ſitque illud 95 grad. hoc 133 gr. & angulus ab ijs comprehenſus 108 grad. 39 ſcr. 30 ſec. & in hoc triang. adhibenda eſt prop. præcedens, ſed nos hanc formulam nunc ſequemur, primus ergo & ſecundus quotus invenietur per proſtaphæreſin puram, ſic:

gr. ſcr.

gr. ſcr. ſec.

	71	20	30		
	85				
compl.	18	39	30		
	103	39	30	ſin. 9717309	
	66	20	30	ſin. 9159545	
				ſumma 18876854	

quotus 1. dimid. 9438427.

gr. ſcr. ſec.

	18	39	30	
compl.	85			
	71	20	30	
	156	20	30	ſin. 4012818
	13	39	30	ſin. 2361315

6374133 ſumma

3187066 dimid. quot. 2.

ſin. comp. ang. *e*. 871557

tang. ang. *a*. 10723687

quotus 3. 939630 factum

quotorum ſumma 3187066
939630
4126696

Fiat ergo,

ut 9438427 ad ſin. compl. *a* ita 4126692
6819984

ad tangentem compl. lateris *ai* 2971257, cui competunt 16 gr. 32 ſcr. 52 ſec. ergo ipſum latus eſſet 73 gr. 27 ſcr. 8 ſec. paulo majus quam ſupra invenimus, ob calculi lubricitatem; Poſſent quoque tali triangulo, ubi duo dantur latera & ang. ab iis compreheuſus, reliqui antecedentis propoſitionis modi applicari, ſed nobis ſolummodo indicaviſſe nunc ſufficiet, tu ſi libet etiam illos adhibeto.

VII. PRO-

VII. PROPOSITIO.

Datis duobus tripleuri lateribus, & angulo uni eorum oppoſito, angulum reliquo oppoſitum quoque invenire.

ENIMVERO cum per propoſitionem 13 libr. 3. ſinus laterum oppoſitorum angulorum ſinibus proportionales ſint.

Fiat ut ſinus lateris, ad ſinum anguli ſibi oppoſiti; ita ſinus lateris alterius, ad ſinum anguli quæſiti ſecundo oppoſiti.

Ut ſi detur in triangulo *aei*

latus *ei* 44 gr. 43 ſcr.
& *ai* 73 gr. 25 ſcr.
& angulus *a* 47 gr. 0 ſcr.

Hinc quæratur angulus *e*. Erit itaque

ut ſin. *ei*	ad ſin. *a*	ita ſin. *ai*
44. 43.	47. 0.	73. 25.
7036014.	7313537.	4584056 ad

ſinum anguli *e* ſed quia hic caſus ferè ſunt amphiboli, ut & majores & minores quadrante poſſint eſſe, ideo opus eſt præſciri anguli ſpeciem. ſit itaque nunc angulus *e* ex theſi acutus, is igitur erit 85 grad.

Reliquos caſus, qui determinationem ſuæ ſpeciei de ſuo promunt; vide prop. 35 lib. 3.

Atque hic vides unica tantum opus eſſe diviſione, cum factus à ſecundo & tertio ſola proſtaphæreſi inveniri poſſit, hoc modo,

a. 47 0

a 47 o
ai 73 25
ce 43
116 25 8955824
30 25 5062846
14018670
7009335

hic poſtpoſitis 7 circulis 700933 50000000 per primum 7036014 erit dividendus: at ſi multiplicatio præ diviſione tibi arrideat utere modo ſequenti.

II. Idem Aliter,

Sola multiplicatione.

QVIA id in obliquangulis etiam ſumus profeſſi, nos opus diviſionis ubique declinaturos, idem hic quoque conabimur.

Enimvero rectangulum quod ſit ſub ſinibus anguli & lateris adiacentis, applicetur ad ſinum totum.

Et erit, Vt ſinus totus ad quotum hunc, ita ſecans complem. lateris reliqui ad ſinum anguli primo oppoſiti.

Atque hic quidem quotus ille ſola & pura proſthaphæreſi inveniri poteſt: Eſto exemplum idem quod prius;

ei 44 gr. 43 ſcr.
ai 73 gr. 25 ſcr.
a 47 gr. o ſcr. & quæratur angulus *e*.

ai 73. 25.
a 47. o.
16 35
63 35. 8955824
30 25. 5062846
14018670
7009335

Hinc

Hinc proportio. ſec.com.*ei*

10000000 7009335 14212592 ad 9962081 ſinum ang. quæſiti *e* 85 gr o ſcr. 32 ſec. vel 94 gr. 59 ſcr. 28 ſec. nam hi caſus fere ſunt amphiboli. certorum determinationem petas ut ſuprà è propoſ. 35 lib. 3. veritatemque demonſtrationis, partim ex diagrammate prop. 5. hujus, partim ex propoſ. 18 lib. primi.

Cum enim ſit ut ſin. *ei* ad ſin. *a*, ita ſin. *ai*. ad ſin. *e*. ſi rectang. *a* in *ai*, applices ad *ei* tanquam ſinum totum, veniet quotus iſte veluti pro ſinu *e* eritque ut ſinus *ei*, ad ſinum totum, ita ſin. *e*, ad hunc quotum, ſeu ut ſinus *ei* ad ſinum *e*, ita ſinus totus ad quotum, ſed qualis ratio eſt ſinus *ei* ad ſinum totum, talis quoque eſt ſinus totius, ad ſecant. compl. *ei* per 18 prop. lib. 1. erit ergo, ut radius, ad iſtum quotum, ita ſecans compl. *ei* ad ſinum ang. *e*.

III. IDEM ALITER.

RECTANGVLVM *quod fit ſub ſecantibus complementi anguli dati, & lateris adiacentis, applicetur ad ſinum totum.*

Et erit, Ut ſinus totus, ad hunc quotum, ita ſinus lateris reliqui, ad ſecantem complementi anguli primo oppoſiti.

Hic modus ex antecedente derivatur, quemadmodum alibi à nobis factitatum; Exemplum idem eſto quod prius. Rectangulum ſub ſecantibus qui pertinent ad complementa anguli dati 47 gr. o ſcr. & lateris adjacentis 73 gr. 25 ſcr. nempe à 13673-275 & 10433995 eſt 14266688, Hinc proportio

ſin. *ai*.

ut 10000000, ad 14266688, ita 7036014, ad 10038062, ſecantem complementi anguli *a*: debentur autem

autem huic ſecanti 4 gr. 59 ſcr. 30 ſec. Et quum incertum ſit (niſi ex hypotheſi ejus ſpecies definiatur) an acutus vel obtuſus ſit, erit itaque vel 85 gr. 0 ſcr. 30 ſec. vel 94 gr. 59 ſcr. 30 ſec. fere ut prius. Et cum uterque calculus & numeri aſſumpti bene accurati ſint, tamen ferè dimidio ſcrupulo ab illo abimus diverſi. Quamobrem quoad licet finibus quam maxime eſt inſiſtendum.

Cæterum vides hoc opus geminâ multiplicatione abſolvi, niſi proſtaphæreſin ſpuriam velis adhibere; at in modo ſecundo pura proſtaphæreſis una multiplicatione abacos levat, ut tantum unicâ opus ſit, illo igitur potius utitor; hic autem tibi varietati & oblectationi potius ſit, quam uſui.

VIII. PROPOSITIO.

Datis tripleuri duobus angulis, & latere uni eorum oppoſito, latus reliquo oppoſitum invenire.

ID quoque ex eadem 13 propoſ. libr. 3 eſt manifeſtum:

Fiat enim, ut ſinus anguli dati, ad ſinum dati lateris oppoſiti, ita ſinus reliqui anguli, ad ſinum lateris ſibi oppoſiti. ut ſi detur in triangulo *aei*,

a 47 gr. 0 ſcr.
e 85 gr. 0 ſcr.

& *ei* 44 gr. 43 ſcr. atque quæratur latus *ai* ut hic vides, ut ſin. *a*. ad ſin. *ei*, ita ſin. *e*, ad ſin. *ai*

7313537 7036014 9961948 9583920

quare latus *ai* erit 73 gr. 24 ſcr. 50 ſec. vel 107 gr. 35 ſcr. 10 ſec.

Ubi iſta amphibolia, vel ſolutio gemina locum non habeat, videto prop. ultimâ libr. 3. iſtic enim ea ſpeciatim annotavimus.

II. IDEM ALITER,

Sola multiplicatione.

ENIMVERO, *rectangulum quod fit ſub ſinu lateris dati & anguli adiacentis applicetur ad radium. Et erit, ut ſinus totus ad hunc quotum; ita ſecans complementi anguli reliqui, ad ſinum lateris primo oppoſiti.*

Demonſtratio ex antecedente modo ita derivatur, quemadmodum propoſ. 7 modus ſecundus è primo.

Exemplum idem eſto quod prius

a 47 gr. 0 ſcr.

e 85 gr. 0 ſcr.

& *ei* 44 gr. 43 ſcr. & quæratur latus *ai*. Hic quotus primus ſola proſtaphæreſi invenitur, hoc modo,

e.	85.	0	
ei.	44.	43.	
	5.	0	
	49	43.	7628564
	39	43.	6389916
			14018480
			7009240

Atque hinc proportio, ſec. com. *a*

ut 10000000 ad 7009340, ita 13673275. ad 9583926 ſinum lateris *ai* 73 gr. 24 ſcr. 51 ſec.

Poſſemus quoque tertium modum prop. antecedentis adhibere ſed quoniam ille ſecantibus abſolvitur, hunc ſecundum in uſu præferendum cenſeo, & ſane omnem varietatem in calculo perſequi quid aliud eſt quam otio ſuo nimis ſecurè abuti? nos cum maxime neceſſaria ſuis locis explicuerimus nunc FINEM LIBRO QVARTO imponentes, ſingulorum tripleurorum Rectangulorum & obliquangulorum Διορθώσεων Indicem hic ſubjicimus;

INDEX

INDEX

ΔΕΔΟΜΕ'ΝΩΝ

in tripleuris rectangulis,

Libro Tertio.

1. Ex data baſe & ang. adjacente, dantur { *latus ang. oppoſitum, per prop. 14.* / *latus adjacens, per 26.* / *angulus reliquus, per 29.*

2. Ex data baſe & crure alterutro, dantur { *angulus cruri oppoſitus, per 16.* / *crus reliquum, per 17.* / *angulus adjacens, per 27.*

3. Ex data crure & ang. adjacente, dantur { *baſis, per 28.* / *crus reliquum, per 23.* / *ang. crur. dato oppoſ. per 19.*

4. Ex dato crure & ang. oppoſito, dantur { *baſis, per 15.* / *ang. adjacens, per 20.* / *crus reliquum, per 25.*

5. Ex dato crure utroque, dantur { *ang. obliq. uterque, per 24.* / *baſis, per 18.*

6. Ex dato utroque ang. obliquo, dantur { *crus utrumque, per 21.* / *baſis, per 30.*

Obliquangula tripleura reductione ad rectangula ſolvuntur per propoſitiones 36, 37, 38, 39, 40, 41, 42, 43, quas vide.

Δεδομένα obliquangulorum abſque reductione ad rectangula,

Libro Qvarto.

1. *Datis lateribus tripleuri, inveniuntur anguli, per prop. 1.*
2. *Datis angulis, inveniuntur latera, per 2.*
3. *Datis duobus lateribus & angulo ab ipſis comprehenſo, invenitur reliquum latus, per 2.*
4. *Datis duobus ang. & latere quod utrique eorum adjacet, invenitur reliquus angulus, per 4.*
5. *Datis duobus later. & ang. ab ipſis comprehenſo inveniuntur reliqui anguli, per 5.*
6. *Dato tripleuri latere, & ang. duobus adjacentibus, inveniuntur reliqua latera, per 6.*
7. *Datis duobus later. & angulo uni eorum oppoſito, invenitur ang. reliquo oppoſitus, per 7.*
8. *Datis duobus ang. & latere uni eorum oppoſito, invenitur latus reliquo oppoſitum, per 8.*

FINIS.

PROBLE-

PROBLEMATA SPHÆRICA.

Primvm Problema.

Dato Solis loco & maximâ declinatione, eius declinationem & aſcenſionem rectam, nec non angulum Eclipticæ & Meridiani invenire.

SIt in diagrammate ſequenti, *a* principium Arietis, *ae* pars Eclipticæ inter illud & locum Solis *i*, *ao* pars Æquatoris, *io* declinatio Solis quæſita, *ao* aſcenſio recta: in tripleuro itaque *aoi* rectangulo ad *o*, dato angulo *iao* menſura ſcilicet maximæ Solis declinationis 23 gr. 31 ſcr. 30 ſec. qualem Nobil. Tycho Brahe præcedenti ſeculo invenit, & latere *ai* quod eſt diſtantia loci Solis ab initio Arietis, puta 60 grad. erit per prop. 14. lib. 3. conſ. 1.

ut ſin.totus,	ad ſin.baſis,	ita ſin.ang.	ad ſin.cruris
	ai	*a*	*io.*
10000000	8660254	3991513	3456732

cui competunt 20 gr. 13 ſcr. 22 ſec. pro declinatione Solis in principio Geminorum. Et per prop. 26. ejuſdem, conſ. 1,

ut ſin.totus,	ad ſin.com.	ita tangens,	ad tangentẽ
	ang. *a*	baſ. *ai*	cruris *ao.*
10000000	9168858	17320508	15880838

cui cedunt 57 gr. 48 ſcr. 6 ſec. tanta eſt aſc. recta principij Geminorum.

Ut autem angulus Eclipticæ & Meridiani *aio*

inveniatur, ex ijſdem datis quæ fuerunt ſuprà, fiat per prop.29.conſ.1.

ut ſin.tot.	ad ſin.com.	ita tangens	ad tan.com.
	baſ.*ai*	ang.*a*	quæſiti *i*.
10000000	5000000	7353314	2176657

12 gr.16 ſcr, 47. ſec. ergo ipſe datur 77 gr.43 ſcr. 13 ſec.

Potuimus etiam idem explorare ex data baſe *ai* & crure *io*, item ex angulo *a* & crure *io*, vel ex utroque crure recti, ſed nunc brevitati ſtudentes, ſimpliciſſimum calculum adhibuimus, tu ſi libet in alijs propoſitionibus tete exerceas.

At contrà ſi detur Solis declin. *io*, & ang. *iao* poteris invenire locum ejus *ai* ab æquinoctio per prop.15 lib.3. aut etiam dato crure utroque, vel *ao* & angulo adjacente, per propoſ.18 & 28.

II. PROBLEMA.

Datâ ſtellæ longitudine & latitudine, eius declinationem & aſcenſionem rectam invenire.

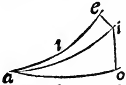
DETUR longitudo & latitudo clariſſimæ Hyadarum, oculi Tauri, quem Palilitium veteres vulgò vocabant: Plinius l.18 cap.26. Hoc eſt vulgò appellatum ſydus Palilitium, quoniam XI Kal. Maji urbis Romæ natalis. Cic. 2 de divinat: Ab ijs Parilibus quibus Romam à Romulo conditam accepimus, diem natalem illius urbis repetebat L. Tarutius Firmanus, imprimis Chaldaïcis rationibus eruditus.

Declinatio igitur ejus & Aſcenſio recta quæratur anno 1625.

Tychoni anno 1600, eſt ejus { long.64.gr. 12 ſcr. / lat.5 gr.31 ſc.Auſtral.

Latitu-

Latitudo Fixarum perpetuo manet invariata, at longitudo ſingulis 75 annis promovet 1 grad. ad iſtam igitur long. addatur gradus pars tertia, & erit iſta dato anno 1625 congrua 64 gr. 32 ſcr.



Sit *i* Palilitium, *ae* ejus in Ecliptica longitudo 64 gr. 32 ſcr. *ei* latitudo auſtralis 5 gr. 31 ſcr. & *io* declinatio, *ao* quæſita aſcenſio recta.

In tripleuro rectangulo *aei*, datis cruribus *ae ei*, erit per prop. 18 lib. 3 conſ. 1.

ut ſin. tot.	ad ſin. com.	ita ſin. com.	ad ſin. com.
	ei	*ae*	baſis *ai*
10000000	9953682	4299859	4209943,

24 gr. 53 ſcr. 50 ſec.

Unde ipſa baſis *ai* venit 65 gr. 6 ſcr. 10 ſec.

Et per propoſ. 24 lib. 3. conſ. 1.

ut ſin. tot.	ad ſin. crur.	ita tan. com.	ad tan. com.
	ea	*ie*	ang. *iae*,
10000000	9025853	103538274	93452124,

83 gr. 53 ſcr. 31 ſec. ergo ipſe angulus *iae* quæſitus erit 6 gr. 6 ſcr. 29 ſec.

Cumque *eai* ſit hoc caſu pars anguli *eao* 23 gr. 31 ſcr. 30 ſec. qui inclinationem Eclipticæ & Æquatoris menſurat, dabitur inde reliquus *iao* 17 gr. 25 ſcr. 1 ſec.

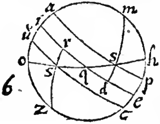
Atque ideò in tripleuro rectangulo *aio*, datâ baſe *ai* & angulo acuto *iao*, dabitur quoque per prop. 14. crus *io* declinatio ſtellæ quæſita 15 gr. 45 ſcr. 13 ſec. & per prop. 26 crus *ao* aſcenſio recta ejuſdem, 64 gr. 3 ſcr. 37 ſec. Si ſtella non incidat intra Eclipt. & Æquatorem ut ſit hic, ſed evagetur verſus alterutrum ejus polum, tum poſito diagrammate ang. primò inventus, erit addendus ad obliquitatem Eclipticæ, cæteraque inſtituenda ut ante,

nali Solis, aut ſtellæ propoſitæ: hæc, quia declin. Solis ſupponitur borea, ab aſc. rectâ ablata, relinquit aſc. obliquam pro crure *he* 29 grad. 28 ſcr. 33 ſec. ſin autem declin. fuiſſet aſſumpta auſtralis, tunc hæc differentia aſcenſ. fuiſſet addenda, & veniſſent 266 gr. 7 ſcr. 39 ſec. pro aſcenſione obliquâ principij Sagittarij: nam arcuum qui æqualiter ab Æquatore recedunt, eadem eſt ratio.

Contrà, ſi detur elevatio Poli; ſeu compl. anguli *lem*, & aſcenſio obliqua *he*, cum declinatione *lm*; tum invento arcu *em*, per antecedentem calculum, eoque addito ad *he*, dabitur *hm* aſcenſio recta arcus *hl*, & proinde etiam locus Solis ei reſpondens. Item datâ Solis declin. *lm*, & differentiâ aſcenſionali *em*, dabitur per prop. 24 lib. 3. angulus *lem*, cujus complementum eſt elevatio Poli *kd*.

IV. PROBLEMA.

Datâ alt. Poli, & Solis aut ſtellæ loco, eius amplit. ortivam, arcum diurnum & noct. horamque ortus & occaſus explorare.



SIt in appoſito diagrammate, Polus arcticus *m*, antarcticus *z*, Æquator *iqe*, Horizon *oqh*, locus Solis aut ſtellæ *s*, ejuſque parallelus diurnus *asp* vel *usc*, Declinatio borea *sd* vel auſtrina *sr*. Formatur ergo tripleurum *qds*, ab Æquatore *qd*, Horizonte *qs* & Meridiano *msd*, in quo præter ang. rectum ad *d*, datur angulus *sqd* ſeu compl. elevationis Poli 37 gr. 49 ſcr. 30 ſec. & crus *sd* declin. Solis cum eſt in

principio Gemin. 20 gr. 13 ſcr. 22 ſec. quæritur baſis *qs*; Erit ergò per prop. 15 lib. 3 conſ. 1.

ut ſin. tot. ad ſec. com. ita ſin. crur. ad ſin. baſis

	ang. *q*	*sd*	*qs*
10000000	16306516	3456713	5636694

cui competunt 34 gr. 18 ſcr. 36 ſec. pro amplitudine ortiva Solis, in principio Geminorum; aut ſtellæ in tali declin. conſtitutæ.

In eodem tripleuro *qds*, dato ang. *sqd*, & crure *sd*, invenitur crus alterum *qd*, per prop. 25 lib. 3. conſ. 1. hoc modo,

ut ſin. tot. ad tan. com. ita tan. crur. ad ſin. crur.

	ang. *q*	*sd*	*qd*
10000000	12880314	3683799	4744650

cui cedunt 28 grad. 19 ſcr. 28 ſec. ejus compl. *de* eſt menſura anguli *dme*, ſeu arcus ſeminocturnus 61 gr. 40 ſcr. 32 ſec. & crus hoc *de* additum quadranti *iq*, dat arcum ſemidiurnum 118 gr. 19 ſcr. 28 ſec. arcus autem ſeminocturnus in horas converſus, dat 4 hor. 6 ſcr. 42 ſec. pro ortu Solis poſt mediam noctem: & arcus nocturnus totus eſt 8 hor. 13 ſcr. 24 ſec. ergo etiam diurnus 15 hor. 46 ſcr. 36 ſec. & ſemidiurno in horas converſo, venit hora occaſus Solis 7 hor. 53 ſcr. 18 ſec. poſt meridiem.

Eadem erit inquiſitio *qs* in tripleuro *qrs*, ubi declin. Solis auſtralis eſt *sr*, & ang. ad *q* idem, ad *r* rectus: ſi cui calculus arrideat, idem in iſto tripleuro experiatur, nobis ſaltem indicaviſſe ſufficit.

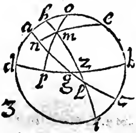
At contrà in eodem tripleuro *qds*, datâ amplit. ortiva *qs*, & declin. Solis *sd*, poteſt inveniri ang. *sqd* ſeu compl. elevationis Poli per prop. 16 lib. 3. & *qd* complem. arcus ſeminocturni per prop. 17. Item dato comp. arcus ſeminocturni ſeu horæ ortus Solis *qd*, & ang. ad *q*, invenitur baſis *qs* per prop. 28, & crus *sd* per prop. 23. Item dato ang. ad

q, &

q, & decl. Solis *sd*, invenitur *qs* amplit. ortiva per prop. 15, & *qd* comp. arcus ſemino&ctnurni per 25. Denique datis *qd* & *qs* invenies ang. *q* per 27, & *sd* per 17.

V. PROBLEMA.

Datâ elevatione Poli, horâ diei, & loco Solis, eius Azimuth & Almicantarath, item ang. Verticalis & Ecliptica invenire.



IN adjecto diagrammate, ſit *e* Polus arcticus, *o* punctum Verticale, *agc* Æquator, *hzi* Ecliptica, *dgb* Horizon, *m* locus Solis, *omp* circulus verticalis per locum Solis in Horizontem eductus, & ſit exempli gratia arcus *be* elevatio Poli 52 gr. 10 ſcr. 30 ſec. loci Solis in principio Geminorum, declinatio *nm* 20 gr. 13 ſcr. 22 ſec. & hora antemeridiana decima, cui cedit arcus *an* ſeu ang. *aen* 30 gr. Quæritur ang. *dop* Azimuth Solis à meridie, arcus *mp* altitudo eius ſuprà Horizontem, & ang. *hmo* Verticalis & Eclipticæ. In tripleuro itaque *oem* in quo dantur latera *oe* 37 gr. 49 ſcr. 30 ſec. *em* 69 gr. 46 ſcr. 38 ſe. & angulus ab ijs comprehenſus *oem* 30 gr. invenietur latus *om* per propoſ. 3 lib. 4 modum 3: ſic,

ut ſinus totus,	ad rect. ſub ſinib. crur. *oe me*,	Ita ſin. verſ. ang. *e*
10000000	5754533	1339746

ad diff. inter ſin. verſ. baſ. & diff. crur. 770961
hæc differentia ad ſin. verſ. diff. crurum 1515102
addita,

addita, dat ſin. verſ. baſis *om* 2286063, & proinde ſinum comp. 7713937, cui cedunt 50 gr. 28 ſcr. 45 ſe. pro arcu *mp* qui menſurat Almicantarath ſeu alt. Solis ſuprà Horizontem.

Deinde ex ijſdem datis, invenitur per prop. 5 lib. 4, modum 1. ang. *moe* ſic: unum rectang. quot fit ſub ſinu lateris *me* & ſin. ang. *meo* eſt 4691778, alterum quod fit ſub ſinu *me* & ſin. comp. ang. *e*, eſt 8126398; tertium quod fit ſub ſin. compl. lateris ejuſdem, & tang. lat. *oe* eſt 2683718; Fiat ergo

ut 1 quotus,	ad ſin. comp. *oe*	ita differ. 2 & 3 quoti
4691778	7898827	5442680

ad tang. compl. ang. *moe* 9163001

Cui cedunt 42 gr. 29 ſc. 56 ſe. & hinc angulus exterior *dop* datur 47 gr. 30 ſcr. 4 ſe. pro Azimutho Solis à meridie, ſeu arcu *dp*. Simili modo invenitur ang. *ome* 28 grad. 48 ſcr. 21 ſe. qui ſi ſubducatur de anguli *emz* Merid. & Eclipt. probl. 1 inventi reſiduo, ſcilicet 102 gr. 16 ſcr. 47 ſe. manebit angulus Verticalis & Eclipt. *omh*, qui quærebatur 73 grad. 28 ſcr. 26 ſe. ſi fuiſſet aſſumtum ſignum poſt principium Cancri, fuiſſet ſubducendus de ipſo ang. Eclipt. & Meridiani.

Contrà: ſi detur alt. Solis *mp* & ang. Azimuthalis *dop*, cum comp. elevat. Poli *oe*, tunc datis in tripleuro *moe*, angulo ad *o*, & lateribus duobus *om oe*, invenietur hora diei, ſeu arcus horarius *an* qui eſt menſura ang. *meo*, per prop. 5 lib. 4: aut etiam ſi detur ſola alt. *mp* ſine Azimutho; tunc namque aſſumentur omnia latera, nempe *om* comp. altit. *oe* comp. elevat. Poli, & *me* comp. declin. Solis, & invenietur ang. *oem* per prop. 1 lib. 4. Sin verò detur declin. Solis *nm*, altitudo ejus *mp*, & horâ diei; datis in tripleuro *meo*, duobus later. *mo me*, & ang.

uni eorum oppoſito : invenietur reliquus *moe*, reſiduum Azimuthi per prop. 7, ejuſdem.

Si detur locus ſtellæ ad *m*, & deſyderes ejus alt. & Azimuth ad certam horam, tunc adde gradus Æquatoris horæ propoſitæ competentes, aſcenſioni rectæ Solis, & veniet aſcenſ. recta medij cæli; hanc aufer ab aſc. rectâ ſtellæ, ſi ea ad ortum vergat, aut hanc ab illâ ſi vergat ad occaſum, & habebis diſtantiam ſtellæ à meridie in gradibus Æquatoris, ſeu arcum *an*; unde in tripl. *meo*, datis later. *me* complem. declin. ſtellæ, *eo* complemento elev. Poli, & ang. *meo*: invenitur baſis *om* per prop. 3 lib. 4, cujus complementũ *mp* eſt alt. ſtellæ quæſita, & ang. *moe* per prop. 5 eiuſdem, cujus reſiduum *dop* eſt Azimuth ſtellæ optatum : aut ſi econtrà detur alt. ſtellæ *mp*, aut etiam Azimuth *dop*, tum in tripleuro *emo*, datis tribus later. invenitur ang. *oem* ſeu diſtant. ſtellæ à merid. eaque in horas converſa, ſi ſtella conſtituatur ad ortum, auferenda eſt ab ejus aſc. rectâ, addenda ſi ſecus, & venit aſc. recta medij cœli; à qua rurſus ſublata aſc. recta Solis, dat arcum Æquatoris inter Solem & Meridianum, qui metitur horas à meridie elapſas.

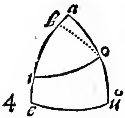
VI. PROBLEMA.

Datâ elevatione Poli, loco Solis eiuſque ſub Horiz. depreßione initio crepuſculi, huius magnitudinem perſcrutari.

IN diagrammate appoſito, Sol hæreat in 15 grad. Aquarij in *e*, & ſit Horizon *acb*, Põlus antarcticus *i*,

VII. PROBLEMA.

Datâ longitudine & latitudine duarum ſtellarum, earum diſtantiam invenire.



IN diagrammate, ſit *a* Polus Eclipticæ *eu*, *i* lucida Arietis, *o* Capella Olenia Iovis nutrix, *io* harum diſtantia quam quærimus; & quidem ad annum 1625 datur

LucidæArietis lon.2 gr.25 ſc.Tau.lat.9 gr.57 ſc.B.
Capellæ lon.16 gr.35 ſcr.Gem.lat.22 gr.51 ſc.Bor.

& hinc in tripleuro *aoi*, angulus ad *a* ſeu diff. longit. eſt 44 gr. 10 ſc. latus *ao* complementum latitudinis Capellæ 67 gr. 9 ſcr. latus *ia* complementum latitudinis lucidæ Arietis 80 gr. 3 ſcr. demittatur ergo perpendicularis ab *o* in baſin *ai*, ea cadet intrà tripleurum quia anguli ad *a* & *i* ſunt affectionis ejuſdem; unde in tripleuro *abo* rectangulo ad *b*, dato angulo *a* & baſe *ao*, dabitur quoque per prop. 14 lib.3. crus *ob* 39 grad.56 ſcr.46 ſc. & rurſus per prop.26 lib.3 conſ.2. erit

ut ſin. tot. ad ſecant. ang. *a* ita tang. comp. baſ. *ao*
10000000 13940856 4213885
ad tang.compl. crur. *ab* 5874516

nempe 30 gr.25 ſcr,55 ſec. ergo ipſum latus *ab* dabitur 59 gr. 34 ſcr.5 ſe. quo ablato ab *ai* 80 grad.3 ſcr.remanet latus *bi* tripleuri *obi* 20 gr.25 ſcr.55 ſe. ideoque dato etiam *ob*, erit per propoſ. 18 lib. 3 conſ.2.

ut ſinus

ut ſinus totus ad ſec.crur. ita ſec.crur. ad ſec.baſ.
bo *bi* *io*
10000000 13043787 10671358 13919492.
Cui debentur 44 gr. 6 ſcr. 33 ſec.pro diſtantiâ quæſitâ: poteſt idem fieri ex datis aſcenſione rectâ & declinatione ſtellarum; nam crus menſurans diſtantiam ſemper manet idem.

Sic etiam datâ Meridianorũ differentiâ & latitudine duorum locorum in terrâ, invenitur eorum diſtantia: Exempli gratia, ſi detur latitudo Arcis Uraniburgicæ 55 gr. 54 ſcr. & Civitatis Leydenſis 52 gr. 10 ſcr. quarum Illa quondam à magno Heroë Tychone Brahæo, Divæ Uraniæ ſacris deſtinata, benignum per annos benè multos ipſis hoſpitium præbuit, in qua nobiliſſima Aſtronomiæ ſcientia, ſupinitate ſeculi ſuperioris valdè deformata, nitori ſuo reſtituta eſt, eoque æternam Poſteritatis meretur gratitudinem: Hæc Clariſſimi ac nunquam ſatis laudati D. SNELLII noſtri, divinum ingenium vidit ac mirata eſt, *Dum fata Deuſque ſinebant:* ejuſque monumenta haud vulgaria etiamnum oſtendere poteſt, & poſſet amplius, ni præmaturâ nobiſque iniquiſſimâ morte ſublatus, omnes ſpes omniaque vota doctiſſimorum quorumcunque irrita feciſſet: deturque longitudinis horum locorum differentia 7 gr. 45 ſcr. plus minus, pro ang. *iao*; latus *ao* compl. latitudinis Uraniburgicæ 34 gr. 6 ſcr. latus *ai* compl. latitudinis Leydenſis 37 gr. 50 ſcr. In tripleuro igitur *iao*, datis duobus lateribus & angulo ab iis comprehenſo, invenietur baſis *io* per prop. 3 lib. 4 modum 1 ſic:

ai 37 50	*ie* 52 10
ao 34 6	*ou* 55 54
52 10	37 50
86 16 ſin. 9978779	93 44 ſin. 9978779
18 4 ſin. 3101234	18 4 ſin. 3101234
differentia 6877525	ſumma 13080013
dimid. 3438762	dimid. 6540006
quotus 1.	quotus 2.

Fiat ergo,

ut ſin. tot.	ad ſin. com. *a*	ita quot. 1.	ad quartum
10000000	9908659	3438762	3407352

hujus & quoti 2. ſumma 9947358 (quia pertinet ad caſum primum) erit ſinus compl. lateris *io* 84 gr. 7 ſcr. ergo ipſa diſtantia 5 gr. 53 ſcr. ſeu milliarium Germanicorum 88 $\frac{1}{4}$.

VIII. PROBLEMA.

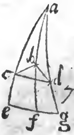
Datis diſtantiis novi alicuius Phænomeni à duabus Fixis, quarum longitudo & latitudo nota fuerit; eiuſdem pariter longitudinem & latitudinem exhibere.

EXEMPLI loco ſit celebris ille Cometa anni 1577, cujus diſtantias per ſextantem vir Illuſtriſſimus Tycho Brahe deprehendit hujus quantitatis.

1 à Lucida Vulturis 26 gr. 48 ſcr.
2 ab inferiori in cornu Capric. 21 gr. 19 ſcr.

Ad iſtum autem annum datur prioris ſtellæ longitudo 25 gr. 50 ſcr. Capricorni, latitudo 29 grad. 20 ſcr. Borea ; poſterioris longitudo 28 grad. 12 ſcr. Capricorni; latitudo 4 gr. 38 ſcr. Borea.

Sit ergo in diagrammate, *a* Polus Eclipticæ *efg*, lucida Vult. *b*, inferior in cornu Capricorni *d*, Cometa verò *c*, & per hæc loca tres deſcendant quadrantes *adg*, *abf*, *ace*, tunc connexis *cb*, *bd*, *cd* quæratur longitudo Cometæ in *e*, & latit. *ec* his modis.



Primò, in tripleuro *bad*, datis duobus cruribus, *da* compl. latit. inferioris in cornu Capricorni 85 gr. 22 ſcr. *ba* comp. latitudinis lucidæ Vulturis 60 gr. 40 ſcr. & angulus *bad* qui eſt diff. long. harum ſtellarum 2 gr. 22 ſcr. erit per prop. 3 lib. 4 modum 3.

ut quad. radij, ad rect. ſub ſin. cr. ita ſin. verſ. ang.
10000000 8689354 8530
ad diff. ſin. verſ. baſ. & diff. crur. 7412

differ. crurum eſt 24 gr. 42 ſc. ſinus verſus 914919, cui ſi addatur different. ſuprà inventa, veniet ſin. verſ. baſis 922331, iſque de radio deductus relinquet 9077669 ſin. comp. baſis *bd* quæſitæ, cui cedunt 65 gr. 11 ſcr. 54 ſec. & proinde ipſa eſt 24 gr. 48 ſcr. 6 ſec. Et in eodem tripleuro, datis omnibus lateribus, erit per prop. 1 lib. 4 modum 4,

ut quad.

ut quad.ſin.tot.	ad rect.ſub.ſec. compl.crur. *bd ad*	ita diff.ſin.verſ. baſ.*ba* & diff. crur.
10000000	23917277	15461

ad ſin. verſ.ang. *adb* 36978

quem ſi auferas à radio, dabitur ſinus comp.anguli ad *d* 9963022 cui cedunt 85 grad.4 ſcr.& proindè ipſe eſt 4 gr.56 ſcr.

Deinde rurſus in tripleuro *bdc*, datis lateribus, *bd* 24 gr.48 ſc.6 ſec. *cd* 21 gr.19 ſcr.*cb* 26 grad.48 ſcr. dabitur per eandem prop. 3 lib.4 angulus ad *d* 72 gr.4 ſcr.40 ſe. cui ſi addas angulum ante inventum *adb*, provenit totus *adc* 77 gr.0 ſcr,40 ſec.

Denique in tripleuro *adc*, datis duobus lateribus *ad* & *dc*, cum angulo ab ipſis comprehenſo, dabitur per prop. 3 lib. 4, baſis *ac* 80 gr. 59 ſcr. 7 ſe. comp. latitudinis Cometæ, unde ipſa latitudo *ce* erit 9 gr. 0 ſcr. 53 ſec. borea. & tunc per prop.7 lib.4, modum 1, erit

ut ſinus *ea*	ad ſinum *d*	ita ſin. *cd*,	ad ſin.ang. *dac*
9876481	9744137	3635222	3586510

cui cedunt 21 gr. 1 ſcr. 2 ſec. pro arcu *eg* ſeu differentia longitudinis inter Cometam & inferiorem in cornu Capricorni: & cum anterior fuerit Cometa hac ſtellâ, ſubtrahatur dictus arcus à longitudine ſtellæ 28 gr. 12 ſcr. & manebit longitudo Cometæ quæſita 7 gr. 10 ſcr. 58 ſec. Capricorni.

Et ſic pleraſque etiam tripleurorum ſphæricorum propoſitiones ad praxin revocavimus; poſſent plura addi, & alio atque alio calculo ſubduci, ſed hoc peculiare opus exigeret, & longiorem in ſingulis moram; quapropter conſulat ſtudioſus lector, Au-

tores Aſtronomicos, inprimis ipſum Ptolemæum, qui iſta libro 2 *μεγάλης συντάξεως* fuſius proſequitur, aut potius à nobis favente Deo pleniorem fortè harum exercitationum aliquando expectet copiam.

FINIS.

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LVGDVNI BATAVORVM.

Apud IOANNEM MAIRE.

CIↃ IↃC. XXVI.

O Grad.

	Sinus	1″	Tangens	1″	Secans.	1″
0	0		0		0	
1	29.09	485	29.09	485	100000.00	
2	58.18		58.18		100000.01	
3	87.27		87.27		100000.03	
4	116.36		116.36		100000.07	
5	145.44		145.44		100000.11	
6	174.53		174.53		100000.15	
7	203.62		203.62		100000.21	
8	232.71		232.71		100000.27	
9	261.80		261.80		100000.34	
10	290.89		290.89		100000.42	
11	319.98		319.98		100000.51	
12	349.06		349.06		100000.61	
13	378.15		378.15		100000.72	
14	407.24		407.24		100000.83	
15	436.33		436.33		100000.95	
16	465.42		465.42		100001.08	
17	494.51		494.51		100001.22	
18	523.60		523.60		100001.37	
19	552.68		552.69		100001.53	
20	581.77		581.78		100001.69	
21	610.86		610.87		100001.87	
22	639.95		639.96		100002.05	
23	669.04		669.05		100002.24	
24	698.13		698.14		100002.44	
25	727.21		727.23		100002.64	
26	756.30		756.32		100002.86	
27	785.39		785.41		100003.08	
28	814.48		814.50		100003.32	
29	843.57		843.60		100003.56	
30	872.65		872.69		100003.81	

89. Grad.

'	Sinus	10"	Tangent.	10"	Secant.	10"
60	10000000		infinitum		infinitum	
59	99999.99		343774667	Vt in	343774682	
58	99999.98		171887319	ſecan	171887348	
57	99999.96		114591530	tibus	114591574	
56	99999.93		85963630		85943689	
55	99999.89		68754887		68754960	
54	99999.85		57295721		57295809	
53	99999.79		49110900		49110702	
52	99999.73		42971757		42991873	
51	99999.66		38197099		38197230	
50	99999.58		34377371		34377516	
49	99999.49		31252137		31252297	
48	99999.39		28647773		28647948	
47	99999.28		26444080		26444269	
46	99999.17		24555198		24555402	
45	99999.05		22918166		22918384	
44	99998.91		21485762		21485995	
43	99998.77		20221875		20222122	
42	99998.63		19098419		1909068[illegible]	
41	99998.47		18093220		18093496	
40	99998.31		17188540		17188831	
39	99998.13		16370019		16370324	
38	99997.95		15625908		15626228	
37	99997.76		14946502		14946836	
36	99997.56		14323712		14324061	
35	99997.36		13750745		13751108	
34	99997.14		13137632		13138013	
33	99996.92		12654019		12654414	
32	99996.68		12204745		12205153	
31	99996.44		11786277		11786702	
30	99996.19		11458865		11459301	

O Grad.

	Sinus	1"	Tangens	1"	Secans.	1"
30	872.65		872.69		100003.81	
31	901.74	485	901.78	485	100004.07	
32	930.83		930.87		100004.33	
33	959.92		959.96		100004.61	
34	989.00		989.05		100004.89	
35	1018.09		1018.14		100005.18	
36	1047.18		2047.23		100005.48	
37	1076.27		1076.32		100005.79	
38	1105.35		1105.42		100006.11	
39	1134.44		1134.51		100006.44	
40	1163.53		1163.61		100006.77	
41	1192.61		1192.70		100007.11	
42	1221.70		1221.79		100007.46	
43	1250.79		1250.88		100007.82	
44	1279.87		1279.98		100008.19	
45	1308.96		1309.07		100008.57	
46	1338.05		1338.17		100008.95	
47	1367.13		1367.26		100009.35	
48	1396.22		1396.35		100009.75	
49	1425.30		1425.45		100010.16	
50	1454.39		1454.54		100010.58	
51	1483.48		1483.64		100011.01	
52	1512.56		1512.73		100011.44	
53	1541.65		1541.83		100011.89	
54	1570.73		1570.93		100012.34	
55	1599.82		1600.02		100012.80	
56	1628.90		1629.12		100013.27	
57	1657.99		1658.21		100013.75	
58	1687.07		1687.31		100014.23	
59	1716.16		1716.41		100014.73	
60	1745.24		1745.51		100015.23	

89. Grad.

	Sinus	10''	Tangens.	10''	Secans.	10''
30	99996.19		11458865		11459301	
29	99995.93		11089205	Vt in	11089656	
28	99995.67		10742648	ſecan	10743114	
27	99995.39		10417094	tibus	10417574	
26	99995.11		10110690		10111185	
25	99994.8.		9821794		9822303	
24	99994.5.		9548947		9549471	
23	99994.21		9290849		9291387	
22	99993.89		9046333		9046886	
21	99993.56		8814317		8814924	
20	99993.23		8593979		8594561	
19	99992.89		8384151		8384947	
18	99992.54		8184704		8185315	
17	99992.18		7994343		7994968	
16	99991.81		7852634		7813274	
15	99991.43		7639001		7639655	
14	99991.05		7472916		7473585	
13	99990.65		7313899		7314583	
12	99990.25		7161507		7162265	
11	99989.84		7015333		7016047	
10	99989.42		6875009		6875736	
9	99989.00		6740185		6740927	
8	99988.56		6610547		6611304	
7	99988.12		6485801		6486572	
6	99987.66		6365674		6366459	
5	99987.20		6249915		6250711	
4	99986.73		6138290		6139105	
3	99986.25		6030582		6031411	
2	99985.77		5926587		5927431	
1	99985.27		5826117		5826975	
0	99984.77		5729869		5728996	

1. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
0	1745.24		1745.51		100015.23	
1	1774.32	485	1774.60	485	100015.74	86
2	1803.41		1803.70		100016.26	87
3	1832.49		1832.80		100016.79	89
4	1861.58		1861.90		100017.33	90
5	1890.66		1891.00		100017.88	91
6	1919.74		1920.10		100018.43	93
7	1948.83		1949.20		100018.99	94
8	1977.91		1978.30		100019.57	96
9	2006.99		2007.40		100020.15	97
10	2036.08		2036.50		100020.73	98
11	2065.16		2065.60		100021.33	100
12	2094.24		2094.70		100021.94	101
13	2123.32		2123.80		100022.91	103
14	2152.41		2152.90		100023.17	104
15	2181.49		2182.01		100023.80	105
16	2210.57		2211.11		100024.44	107
17	2239.65		2240.21		100025.09	108
18	2268.73		2269.32		100025.74	110
19	2297.81		2298.42		100026.91	113
20	2326.90		2327.53		100027.08	113
21	2355.98		2356.63		100027.76	114
22	2385.06		2385.74		100028.45	115
23	2414.14		2414.84		100029.15	127
24	2443.22		2443.95		100029.86	128
25	2472.30		2473.05		100030.57	120
26	2501.38		2502.16		100031.10	121
27	2530.46		2531.27		100032.03	122
28	2559.54		2560.38		100032.77	124
29	2588.62		2589.48		100033.52	125
30	2617.69		2618.59		100034.28	127

88. Grad.

	Sinus	10″	*Tangens*	10″	*Secans.*	10″
60	99984.77		5729869.		5728996.	
59	99984.26	85	5635059	15442	5635946.	15439
58	99983.74	87	5544159.	14947	5545053.	14945
57	99983.21	88	5456130.	14476	5457046.	14473
56	99982.67	90	5370856.	14026	5371790.	14024
55	99982.12	91	5288211.	13598	5289156.	13595
54	99981.57	92	5208067	13188	5209027.	13186
53	99981.11	97	5130316	12797	5131290.	12795
52	99980.44	95	5054851	12423	5055840.	12421
51	99979.86	97	4981573	12063	5982576.	12063
50	99979.27	98	4910388.	11723	4911406.	11720
49	99978.67	100	4841208.	11394	4842241.	11392
48	99978.07	101	4773950.	11080	4774997.	11077
47	99977.75	102	4708534	10778	4709596.	10776
46	99976.83	104	4644886.	10488	4645963.	10486
45	99976.21	105	4582935.	10210	4584026.	10208
44	99275.56	107	4522614	9943	4523719.	9941
43	99974.92	108	4463860	9686	4464980.	9684
42	99974.26	109	4406611.	9439	4407746	9637
41	99973.59	111	4350812	9202	4351961.	9200
40	99972.92	112	4296408	8973	4297571.	8970
39	99972.24	114	4243346	8752	4244525.	8750
38	99971.55	115	4191575.	8540	4192772.	8538
37	99970.85	117	4141059	8335	4142266.	8333
36	99970.15	118	4092741.	8138	4092963	8135
35	99969.43	119	4043584.	7947	4044820.	7945
34	99968.71	121	3996546	7763	3997797.	7761
33	99967.98	122	3950589.	7586	3951855.	7584
32	99967.24	123	3905677	7417	3906957.	7412
31	99964.49	125	3861774	7249	3863068.	7246
30	99965.73	126	3818846	7084	3820155.	7086

1. Grad.

	Sinus	10″	Tangent	10″	Secans	10″
30	2617 69		2618.59		100034.28	
31	2646.77	485	2647.70	485	100035.04	129
32	2675.85		2676.81		100035.82	129
33	2704.93		2705.92		100036.60	121
34	2734.01		2735.03		100037.39	132
35	2763.09		2764.14		100038.19	134
36	2792.16		2793.25		100039.00	135
37	2821.24		2822.36		100039.82	137
38	2850.32		2851.48		100040.65	138
39	2879.39		2880.59		100041.48	134
40	2908.47		2909.70		100042.32	141
41	2937.55		2938.82		100043.17	142
42	2966.62		2967.93		100044.03	144
43	2995.70		2997.04		100044.90	145
44	3024.78		3026.16		100045.78	146
45	3053.85		3055.28		100046.66	148
46	3082.93		3084.39		100047.56	149
47	3112.00		3113.51		100048.46	151
48	3141.08		3142 63		100049.37	152
49	3170.15		3171.74		100050.29	154
50	3199.22		3200.86		100051.21	155
51	3228.30		3229.98		100052.15	156
52	3257.37		3259.10		100053.09	158
53	3286.44		3288.22		100054.05	159
54	3315.52		3317.34		100055.02	161
55	3344.59		3346.46		100055.98	162
56	3373.66		3375.58		100056.96	163
57	3402.73		3404.71		100057.94	165
58	3431.81		3433.83		100058.94	166
59	3460.88		3462.9[illegible]		100059.94	168
60	3489.95		3492.08		100060.95	169

88. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	99965.73		3818846		3820155	
29	99964.97	128	3776861	6933	3778185	6931
28	99964.19	129	3735789	6783	3737127	6781
27	99963.41	131	3695600	6638	3696953	6636
26	99962.62	132	3656266	6497	3657633	6495
25	99961.88	133	3617760	6321	3619141	6359
24	99961.01	135	3580055	6729	3581452	6227
23	99960.19	136	3543128	6102	3544539	6099
22	99959.37	138	3506955	5978	3508380	5975
21	99958.54	139	3471511	5857	3472951	5855
20	99957.69	140	3436777	5741	3438232	5738
19	99956.84	142	3402730	5628	3404199	5625
18	99955.99	143	3369351	5518	3370835	5515
17	99955.12	145	3336619	5411	3338118	5409
16	99954.24	146	3304517	5307	3306030	5305
15	99953.36	148	3273026	5207	3274554	5204
14	99952.47	149	3242129	5109	3243671	5107
13	99951.57	150	3211810	5104	3213366	5011
12	99950.66	152	3182052	4921	3183623	4919
11	99949.74	153	3152839	4831	3154425	4829
10	99948.81	154	3124158	4744	3125758	4742
9	99947.88	156	3095993	4659	3097607	4656
8	99946.93	157	3068331	4576	3069960	4574
7	99945.98	159	3041158	4495	3042802	4493
6	99945.02	160	3014462	4417	3016120	4414
5	99944.05	162	2988230	4340	2989903	4338
4	99943.07	163	2962450	4266	2964137	4263
3	99942.09	164	2937111	4193	2938812	4191
2	99941.10	166	2912200	4122	2913917	4120
1	99940.09	167	2887709	4053	2889440	4051
0	99939.08	169	2863625	3986	2865371	3984

2. Grad.

	Sinus	10"	Tangent	10"	Secans	10"
0	3489.95		3492.08		100060.95	
1	3519.02	484	3521.20	485	100061.97	170
2	3548.09		3550.33		100063.00	172
3	3577.16		3579.45		100064.04	173
4	3606.23		3608.58		100065.09	175
5	3635.30		3637.71		100066,14	176
6	3664.37		3666.83		100067.20	178
7	3693.44		3695.96		100068.28	179
8	3722.51		3725.09		100069.36	180
9	3751.58		3754.22		100070.45	182
10	3780.64		3783.85		100071.54	183
11	3809.71		3812.48		100072.65	185
12	3838.78		3841.61		100073.76	186
13	3867.85		3870.74		100074.88	187
14	3896.91		3899.88		100076.02	189
15	3925.98		3929.01		160077.15	190
16	3955.05		3958.14		100078.30	192
17	3984.11		3987.28		100079.46	193
18	4013.18		4016.41		100080.62	195
19	4042.24		4045.55		100081.70	196
20	4071.40		4074.69		100082,98	197
21	4100.37		4103.82		100084.17	199
22	4129.44		4132.96		100085.37	200
23	4158.50		4162.10		100086.58	202
24	4187.56		4191.24		100087.79	203
25	4216.63		4220.38		100089.02	204
26	4285.69		4249.52		100090.25	206
27	4274.75		4278.66		100091.49	207
28	4303.82		4307.81		100092.74	209
29	4332.88		4336.95		100094.00	210
30	4361.94		4366.09		100095.27	212

87. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	99939.08		2863625.		2865371.	
59	99932.06	170	2839940.	3921	2841700.	3918
58	99937.03	71	2816642.	3856	2818417.	3854
57	99935.1:	173	2793723.	3794	2795512.	3791
56	99934.95	174	2771174.	3733	2772978.	3730
55	99933.9	176	2748985.	3673	2750804.	367
54	99932.83	177	2727149.	3615	2728981.	3613
53	99931.77	179	2705656.	3559	2707503.	3556
52	99930.69	180	2684498.	3503	2686360.	3501
51	99929.6	181	2663669.	3491	2665545.	3447
50	99928.51	183	2643160	3396	2645051.	3394
49	99927.40	184	2622964.	3345	2624869.	3342
48	99926.29	186	2603074.	3294	2604994.	3292
47	99925.17	187	2583482.	3245	2585417	3242
46	99924.04	188	2564183.	3196	2566132.	3194
45	99922.90	190	2545170.	3149	2547134.	3147
44	99921.76	191	2526436.	3103	2528414.	3101
43	96920.60	193	2507976.	3058	2509969	3056
42	99919.44	194	2489783:	3014	2491790.	3011
41	99918.2	195	2471851.	2971	2473873	2668
40	99917.09	197	2454176.	2928	2456212.	2926
39	99915.81	198	2436751.	2887	2438802.	2885
38	99914.70	200	2419571.	2846	2421637.	2844
37	99913.41	201	2402632.	2807	2404712.	2804
36	99912.28	201	2385928	2768	2388022.	2766
35	99911.06	202	2369454.	2730	2371563.	2727
34	99909.83	204	2353205.	2693	2355329.	2690
33	99908.59	207	2337178.	2656	2339316.	2654
32	99907.34	208	2321367.	2620	2323510.	2618
31	99906.09	209	2305768.	2585	2307935.	2583
30	99904.82	211	2290377.	2551	2292559.	2548

2. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	4361.94		4366.09		100095.27	
31	4391.00	484	4395.24	486	100096.54	213
32	4420.06		4424.38		100097.83	214
33	4449.12		4453.53		100099.12	216
34	4478.18		4482.68		100100.42	217
35	4507.24		4511.82		100101.73	219
36	4536.30		4540.97		100103.05	220
37	4565.36		4570.12		100104.37	221
38	4594.42		4599.27		100105.71	223
39	4623.47		4628.42		100107.05	224
40	4652.53		4657.57		100108.41	226
41	4681.59		4686.73		100109.77	227
42	4710.64		4715.88		100111.13	229
43	4739.70		4745.03		100162.51	230
44	4768.76		4774.19		100113.80	231
45	4797.81		4803.34		100115.29	233
46	4826.87		4832.50		100116.70	234
47	4855.92		4861.66		100118,11	236
48	4884.98		4890.82		100119.53	237
49	4914.03		4919.97		100120.96	238
50	4943.08		4949.13		100122.39	240
51	4972.14		4978.29		100123.84	241
52	5001.19		5007.46		100125.29	243
53	5030.24		5036.62		100126.76	244
54	5059.29		5065.78		100128 23	246
55	5088.34		5094.94		100129.71	247
56	5117.40		5124.11		100131.20	248
57	5146.45		5153.28		100132.69	250
58	5175.50		5182.44		100134.20	251
59	5204.55		5211.61		100135.71	253
60	5233.60		5240.78		100137.23	254

87. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	99904.82		2290377		2292559	
29	99903.55	212	2275189	2517	2277386	2515
28	99902.27	214	2260201	2484	2262413	2482
27	99900.98	215	2245410	2452	2247635	2449
26	99899.68	217	2230810	2420	2233050	3418
25	99898.37	218	2216398	2389	2218653	2387
24	99897.06	219	2202171	2358	2204440	2356
23	99895.73	221	2188125	2329	2190409	2326
22	99894.40	222	2174257	2299	2176555	2297
21	99893.06	224	2160563	2270	2162876	2268
20	99891.71	225	2147040	2242	2149368	2240
19	99890.35	226	2133685	2214	2136027	2212
18	99888.99	228	2120495	2187	2122851	2185
17	99887.61	229	2107466	2160	2109838	2158
16	99886.23	231	2094597	2134	2096982	2132
15	99884.84	232	2081883	2108	2084283	2106
14	99883.44	233	2069322	2083	2071737	2081
13	99882.03	235	2056911	2058	2059341	2056
12	99880.61	236	2044649	2034	2047093	2031
11	99879.19	238	2032531	2010	2034989	2007
10	99877.75	239	2020555	1986	2023028	1984
9	99876.31	240	2008720	1963	2011207	1961
8	99874.86	242	1997022	1940	1999524	1938
7	99873.40	243	1985459	1918	1987976	1915
6	99871.93	24[illegible]	1974029	1896	1976560	1893
5	99870.46	246	1962730	1874	1965275	1872
4	99868.97	248	1951558	1853	1954119	1851
3	99867 48	249	1940513	1832	1943088	1830
2	99865.98	250	1929592	1812	1932182	1809
1	99864.47	252	1918793	1791	1921397	1789
0	99862.95	253	1908114	1772	1910732	1769

3. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	5233.60		5240.78		100137.23	
1	5262.64	484	5269.95	486	100138.76	25
2	5291.69		5299.12		100140.30	
3	5320.74		5328.29		100141.85	
4	5349.79		5357.46		100143.41	26
5	5378.83		5386.63		100144.97	
6	5407.88		5415.81		100146.55	
7	5436.93		5444.90		100148.13	
8	5465.97		5474.16		100149.72	
9	5495.02		5503.33		100151.32	
10	5524.06		5532.51		100152.93	
11	5553.1		5561.69		100154.54	27
12	6582.15		5590.87		100156.17	
13	5611.19		5620.05		100157.80	
14	5640.24		5649.23		100159.44	
15	5669.28		5678.41		100161.09	
16	5698.32		5707.59		100162.75	
17	5727.36		5736.78		100164.42	
18	5756.40		5765.96		100166.09	28
19	5785.44		5795.15		100167.78	
20	5814.48		5824.34		100169.47	
21	5843.52		5853.52		100171.17	
22	5872.56		1882.71	487	100172.88	
23	5901.60		5911.90		100174.60	
24	5930.64		5941.09		100176.33	
25	5959.67		5970.20		100178.06	29
26	5988.7		5994.48		100179.81	
27	6017.75		6028.67		100188.56	
28	6046.78		6057.87		100183.32	
29	6075.82		6087.06		100185.09	
30	6104.85		6116.26		100186.87	

86. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	99862.95		1908114		1910732	
59	99861.43	25	1897552	1750	1900185	1750
58	99859.89		1887107	1731	1889754	1730
57	99858.35		1876775	1712	1879438	1712
56	99856.79		1866556	1693	1869233	1695
55	99855.24	26	1856447	1675	1859139	1675
54	99853.67		1846447	657	1849153	1657
53	99852.09		1836554	1639	1839274	1639
52	99850.50		182676	1622	1829500	1622
51	99848.91		181708.	1605	1819830	1605
50	99847.31		1807498	1588	1810262	1588
49	99845.60		1798915	1571	1800794	1571
48	99844.08	27	1788631	1555	791424	1555
47	99842.45		1779344	1539	1782252	1539
46	99840.81		1770153	1523	1771975	1523
45	99839.17		1761056	1507	763893	1507
44	99837.51		1752052	1492	1754903	1492
43	99835.85		1743139	1477	174600	1477
42	99834.18		1734315	1462	1737196	1462
4	99832.50	28	1725581	1447	1728476	1447
40	99830 82		1716932	1433	171 9843	1433
39	99829.12		1708372	1419	1711 297	1419
38	99827.42		1699896	1405	1702835	1405
37	99825.7		691503	1391	1694456	391
36	99823.98		1683191	1377	1686159	1377
35	99822.25		1674961	1364	1677944	1364
34	99820.5	29	1666811	1350	669308	1350
33	99818.77		1658740	1337	1661751	1337
32	99817.01		1650746	1325	1653772	1325
31	99815.25		1642828	1312	1645869	1312
30	99813.48		1634986	1300	1638041	1300

3. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	6104.85		6116.26		100186.87	
31	6133.89	484	6145.46	487	100188.65	29
32	6162.9[illegible]		6174.66		100190.45	30
33	6191.95		6203.86		100192.25	
34	6220.95		6233.06		100194.05	
35	6250.02		6262.26		100195.89	
36	6279.05		6291.47		100197.72	
37	6308.08		6320.67		100199.55	
38	6337.1		6349.88		100201.40	
39	6366.1[illegible]		6379.08		100203.26	31
40	6395.17		6408.29		100205.12	
41	6424.2[illegible]		6437.50		100206.99	
42	6453.2[illegible]		6466.71		100208.87	
43	6482.26		6495.92		100210.76	
44	6511.25		6525.13		100212.66	
45	6540.3		6554.35		100214.57	
46	6569.34		6583.56		100216.48	
47	6598.36		6612.78		100218.40	32
48	6627.35		6641.99		100220.34	
49	6656.4		6671.21		100222.28	
50	6685.44		6700.43		100224.23	
51	6714.46		6729.65		100226.18	
52	6743.48		6758.87		100228.15	
53	6772.5		6788.09		100230.13	
54	6801.53		6817.32		100232.11	33
55	6830.55		6846.54		100234.10	
56	6859.57		6875.77		100236.10	
57	6888.59		6904.95		100238.11	
58	6917.61		6934.22		100240.15	
59	6946.63		6939.45		100242.15	
60	6975.65		6992.68		100244.15	34

86. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	99813.48		1634986		1638041	
29	99811.70	297	1627217	1290	1630287	287
28	99809.91	299	1619523	1277	1622607	1275
27	99808.11	300	1611900	265	1614999	1363
26	99806.31	301	1604348	1254	1607462	1251
25	99804.49	303	1596867	1242	1599995	1240
24	99802.67	304	1589454	1231	1592597	1228
23	99800.84	306	1582110	1219	1585268	1217
22	99799.00	307	1574834	1208	1578005	1206
21	99797.15	309	1567623	1197	1570810	1195
20	99795.30	310	1560478	1186	1563679	1184
19	99793.43	311	1553398	1176	1556613	1173
18	99791.56	313	1546381	1165	1549611	1163
17	99789.68	314	1539428	1155	1542672	1152
16	99787.79	316	1532536	1144	1535795	1142
15	99785.89	317	1525705	1134	1528979	1132
14	99783.99	318	1518935	1124	1522223	1122
13	99782.07	320	1512224	1114	1515527	1112
12	99780.15	321	1505572	1105	1508890	1102
11	99778.21	322	1498978	1095	1502310	1093
10	99776.27	324	1492442	1085	1495788	1083
9	99774.32	325	1485962	1076	1489323	1074
8	99772.37	327	1479537	1067	1482913	1064
7	99770.40	328	1473168	1058	1476558	1055
6	99768.43	330	1466853	1049	1470258	1046
5	99766.44	331	1460592	1040	1464011	1037
4	99764.45	332	1454383	1031	1457817	1029
3	99762.45	334	1448227	1022	1451676	1020
2	99760.45	335	1442123	1014	1445586	1011
1	99758.43	337	1436070	1005	1439547	1003
0	99756.40	338	1430067	1997	1433559	1995

4. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	6133.89		6145.46		100188.65	
1	7004.66	484	7021.91	487	100246.23	341
2	7033.68		7051.15		100248.28	343
3	7062.70		7080.38		100250.35	344
4	7091.7		7109.61		100252.41	346
5	7120.7:		7138.85		100254.49	347
6	7149.74		7168.05		100256.58	348
7	7178.76		7197.33		100258.67	350
8	7207.77		7226.57		100260.78	351
9	7236.78		7255.81		100262.85	353
10	7265.80		7285.05		100265.01	354
11	7294.81		7314.30		100267.14	356
12	7323.82		7343.54		100269.27	357
13	7352.83	483	7372.79		100271.42	358
14	7381.84		7402.03		100273.58	360
15	7410.85		7431.28		100275.74	361
16	7439.86		7460.53	488	100277.91	363
17	7468.86		7489.78		100280.05	364
18	7497.87		7519.04		100282.28	366
19	7526.88		7548.29		100284.48	367
20	7555.88		7577.55		100286.68	368
21	7584.89		7606.80		100288.90	370
22	7613.89		7636.06		100291.12	371
23	7642.90		7665.32		100293.35	333
24	7671.90		7694.58		100295.60	374
25	7700.91		7723.84		100297.84	376
26	7729.91		7753.10		100300.10	377
27	7758.91		7782.37		100302.37	379
28	7787.91		7811.63		100304.64	380
29	7816.91		7840.90		100306.93	381
30	7845.91		7870.17		100309.22	383

85. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	99756.40		1430067		1433559	
59	99754.37	340	1424113	989	1427620	986
58	99752.32	341	1418209	981	1421730	978
57	99750.28	342	1412354	973	1415889	970
56	99748.22	344	1406546	965	1410096	962
55	99746.15	346	1400786	957	1494350	954
54	99744.08	347	1395072	949	1398651	947
53	99741.99	348	1389404	941	1392999	939
52	99739 90	349	138378[illegible]	934	1387391	931
51	99737.80	351	1379201	926	1381829	924
50	99735.69	352	1372674	919	1376311	917
49	99733.57	354	1367186	912	1370838	909
48	99731.45	355	361741	904	1365408	902
47	99729.31	356	1356335	897	1360021	895
46	99727.17	358	135098[illegible]	890	1354676	888
45	99725.02	359	1345663	883	1349373	881
44	99722.90	361	134038[illegible]	879	1344112	874
43	99720.69	362	133515[illegible]	870	1338891	867
42	99718.51	363	132995[illegible]	893	1333712	860
41	99716.33	365	1324803	856	1328572	854
40	99714.13	366	131 9688	850	1323472	847
35	99711.93	368	1314613	843	1318411	841
38	99709.72	369	1309576	837	1313388	824
37	99707.50	370	1304577	830	1308404	828
36	99705.27	372	1299616	824	1303458	822
35	99703.04	373	1294692	818	1298549	810
34	99700.79	375	1289806	812	1293677	809
33	99698.54	376	1284956	806	128882[illegible]	803
32	99696.28	377	1284042	800	1284042	797
31	99694.21	379	1275363	794	1279278	791
30	99691.73	380	1270620	788	1274549	786

4. Grad.

	Sinus	10″	Tangens	10″	Secans	10′
30	7845.9		7830.17		100309.22	
31	7874.9	483	7899.44	488	100311.52	384
32	7903.9		7928.71		100313.83	386
33	7932.9		7957.98		100316.14	387
34	7961.90		7987.26		100318.48	389
35	7990.90		8016.53		100320.80	390
36	8019.8		80[illegible]45.8		100323.15	391
37	8048.8		8075.09		100325.50	393
38	8077.8		8104.37		100327.87	394
39	8106.8		8133.65		100330.23	396
40	8135.87		8162.9		100332.61	397
41	8164.86		8192.21		100335.01	399
42	8193.85		8221.50		100337.40	400
43	8222.84		8250.78		100339.80	401
44	8251.8		8280.07		100342.21	403
45	8280.8		8309.36		100344.63	404
46	8309.8		8338.65		100347.0	406
47	8338.80		8367.94		100349.50	407
48	8367.78		8397.23		100351.9	409
49	8396.77		8426.53		100354.4	410
50	8425.76		8455.82		100356.8	412
51	8454.7		8485.12		100359.34	413
52	8483.7		8514.4		100361.82	414
53	8512.7		8543.72		100364.31	416
54	8541.6		8573.02		100366.82	417
55	8570.67		8602.3		100369.31	419
56	8599.66		8631.6		100371.83	420
57	8628.64		8660.94		100374.35	422
58	8657.62		8690.25		100376.90	423
59	8686.6		8719.56		100379.43	424
60	8715.57		8748.87		100381.99	426

85. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	99691.73		1270620		1274549	
29	99689.44	382	1265912	782	1269856	780
28	99687.15	383	126123[illegible]	777	1265197	774
27	99684.84	384	1256600	771	1260572	768
26	99682.53	386	1251994	765	1255981	763
25	99680.21	387	1247422	760	1251424	757
24	99677.89	389	1242883	754	1246899	752
23	99975.55	380	1238377	749	1242408	746
22	99673.20	382	1233903	743	1237948	741
21	99670.85	393	1229461	738	1233521	736
20	99668.49	394	1225051	733	1229125	730
19	99666.12	396	1220672	728	1224761	725
18	99663.73	398	1216324	723	1220427	720
17	99661.35	399	1212006	717	1216125	715
16	99658.95	310	1207719	712	1211852	710
15	99656.55	401	1203462	707	1207610	705
14	99654.13	403	1199235	702	1203397	700
13	99651.71	404	1195037	698	1199214	695
12	99649.29.	406	1190868	693	1195059	690
11	99646.84	407	1186728	688	1190934	686
10	99644.40	408	1182617	683	1186837	681
9	99641.94	410	1178533	679	1182768	676
8	99639.49	411	1174478	674	1178727	672
7	99637.01	413	1170450	669	1174714	667
6	99634.53	414	1166450	665	1170728	662
5	99632.04	415	1162476	660	1166769	668
4	99629.54	417	1158529	656	1162837	653
3	99627.03	418	1154609	652	1158932	649
2	99624.52	420	1150715	647	1155052	645
1	99622.00	421	1146847	643	1151199	640
0	99619.48	422	1143005	639	1147371	636

5. Grad.

	Sinus	10″	*Tangent*	10′	*Secans.*	10″
0	8715.57		8748.87		100381.98	
1	8744.55	483	8778.18	489	100384.54	42
2	8773.53		8807.49		100387.11	
3	8802.50		8836.81		100389.69	43
4	8831.48		8866.12		100392.27	
5	8860.46		8895.44		100394.86	
6	8889.43		8924.76		100392.47	
7	8918.40		8954.08		100400.08	
8	8947.37		8983.41		100402.70	
9	8976.35		9012.73		100405.32	
10	9005.32		9042.06		100407.96	44
11	9034.29		9071.38		100410.61	
12	9063.26		9100.71		100413.26	
13	9092.23		9130.04		100415.92	
14	9121.19		9159.37		100418.59	
15	9150.16		9188.71		100421.27	
16	9179.13		9218.04		100423.96	
17	9208.09		9247.38		100426.66	45
18	9237.06		9276.72		100429.37	
19	9266.02		9306.06		100432.09	
20	9294.99		9335.40		100434.08	
21	9323.95		9364.74		100437.53	
22	9352.91		9394.09		100440.27	
23	9381.87		9423.43		100443.02	
24	9410.83		9452.78		100445.78	46
25	9439.79		9482.13		100448.55	
26	9468.75		9511.48		100451.32	
27	9497.71		9540.84		100554.11	
28	9526.66		9570.19		100456.90	
29	9555.62		9599.55		100459.70	
30	9584.57		9628.90		100462.51	

84. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
60	99619.48		1143005		1147371	
59	99619.93	424	1139188.49	63437	1143569.16	63194
58	99614.38	425	1135396.96	63018	1139792.20	62775
57	99611.83	427	1131630.40	62604	1136040.21	62361
56	99609.26	428	1127888.55	62193	1132312.93	61951
55	99606.69	429	1124171.71	61787	1128610.13	61544
54	99604.11	431	1120478.03	61385	1124931.56	61142
53	99601.52	432	1116808.88	60987	1121276.99	60744
52	99598.92	434	1113163.50	60592	1117646.17	60349
51	99596.31	435	1109541.64	60202	1114038.90	59959
50	99593.70	436	1105943.09	59815	1110454.92	59572
49	99591.07	438	1102367.63	59431	1106894.02	59189
48	99588.44	439	1098815.01	59051	1103355.99	58801
47	99585.80	440	1095285.04	58677	1099840.59	58434
46	99583.15	442	1091777.49	58304	1096347.61	58062
45	99580.49	443	1088292.14	57935	1092876.84	57693
44	99577.83	445	1084828.80	57570	1089428.07	57328
43	99575.15	446	081387.24	57209	1086001.09	56966
42	99572.47	448	1077967.27	56851	1082595.69	56608
41	99569.78	449	1074568.68	56496	1079211.67	56253
40	99567.08	450	1071191.26	56144	1075848.84	55901
39	99564.37	452	1967834.83	55796	1072506.99	55553
38	99561.65	453	1064499.19	55450	1069185.92	55207
37	99558.93	455	1061184.14	55109	1065885.45	54866
36	99556 20	456	1057889.50	54770	1062605.38	54527
35	99553.45	458	1054615.07	54434	1059345.53	54191
34	99550.70	459	1051360.67	54102	1056105.70	53859
33	99547.95	460	1048126.11	53772	1052885.72	53529
32	99545.18	461	1044911.22	53446	1049685.41	53203
31	99542.40	463	1041715.81	53122	1046504.58	52879
30	99539 62	465	1038539.74	52802	1043343.05	52559

5. Grad.

	Sinus	10″	Tangent	10″	Secans.	10′
30	9584.57		9628.90		100462.50	
31	9613.53	483	9658.26	489	100465.32	471
32	9642.48		9687.62		100468.15	472
33	9671.44		9716.99		100470.99	473
34	9700.39		9746.[illegible]5		100473.83	475
35	9729.34		9775.72		100476.69	476
36	9758.29	482	9805.09		100479.54	478
37	9787.24		9834.45		100482.41	479
38	9816.19		9863.83	490	100485.30	481
39	9845.14		9893.20		100488.19	482
40	9874.08		9922.57		100491.09	484
41	9903.03		9951.95		100493.99	485
42	9931.97		9981 33		100496.90	486
43	9960.92		10010.71		100499.82	488
44	9989.86		10040.09		100502.75	489
45	10018.81		10069.47		100509.70	491
46	10047.75		10098.85		100508.64	492
47	10076.69		10128.24		100511.60	494
48	10105.63		10157.63		100514.57	495
49	10134.57		1018702		100517.53	497
50	10163.51		10216.41		100520.52	498
51	10192.45		10245.80		100523.51	499
52	10221.38		10275.20		100526.51	501
53	10250.32		10304.60		100529.52	502
54	10279.25		10333.99		100532 53	504
55	10308.19		10363.39		100535.57	505
56	10337.12		10392.80		100538.60	507
57	10366.05		10422.20		100541.64	508
58	10394.99		10451.61		100544.70	510
59	10423.92		10481.01		100547.75	511
60	10452.85		10510.42		100550.82	512

84. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	99539.62		1038539.74		1043343.05	
29	99536.82	466	1035382.74	52484	1040200.66	52241
28	99534.02	467	1032244.73	52169	1037077.23	51926
27	99531.21	469	1029125.51	51857	1033972.59	51614
26	99528.40	470	1026024.90	51548	1030886.56	51305
25	99525.58	472	1022942.76	51242	1027818.99	50999
24	99522.74	473	1019878.89	50938	1024769.71	50695
23	99519.90	474	1016833.16	50637	1021738.55	50394
22	99517.04	476	1013805.39	50339	1018725.36	50096
21	99514.19	477	1010795.42	50043	1015729.98	49800
20	99511.31	479	1007803.11	49750	1012752.24	49507
19	99508.44	480	1004828.28	49460	1009792.00	49217
18	99505.55	481	1001870.80	49172	1006849.09	48929
17	99502.67	48[illegible]	998930.50	48886	1003923.38	48643
16	99499.77	484	996007.24	48603	1001014.70	48360
15	99496.85	486	993100.88	48323	998122.91	48080
14	99493.93	487	990211.25	48045	995247.87	47802
13	99491.00	488	987338.23	47769	982389.43	47526
12	99488.08	490	984481.66	47496	989547.44	47253
11	99485.12	491	981641.40	47225	986721.76	46982
10	99482.18	493	978817.32	46956	983912.26	46713
9	99479.21	494	976009 27	46690	981 11880	46447
8	99476.24	495	973217.13	46426	978341.24	46183
7	99473.27	497	970440.75	46164	975579 44	45921
6	99470.29	498	967680.00	45905	972833.27	45661
5	99467.29	401	964934.74	45647	970102.60	45404
4	99464.29	501	962204.86	45392	967387.30	45149
3	99461.28	502	959490.22	45139	964687.24	44896
2	99458.25	504	956790.68	44888	962002.29	44645
1	99455.22	505	954106.13	44639	959332.33	44396
0	99452.19	507	951436.44	44392	956677.22	44149

6. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	10452.85		10510.42		100550.82	
1	10481.77	482	10539.83	490	100553.91	51
2	10510.70		10569.25		100556.99	
3	10539.63		10598.66		100560.09	
4	10568.56		10628.08		100563.19	
5	10597.48		10657.50		100566.31	52
6	10626.41		10686.92		100569.43	
7	10655.33		10716.34		100572.56	
8	10684.25		10745.76		100575.70	
9	10713.17		10775.19		100578.85	
10	10742.10		10804.62		100582.00	
11	10771.02		10834.04		100585.17	
12	10799.94		10863.48	491	100588.34	53
13	10828.8[illegible]		10892.91		100591.53	
14	10857.77		10922.34		100594.72	
15	10886.69		10951.78		100597.92	
16	10915.60		10981.22		100601.13	
17	10944.52		11010.66		100604.35	
18	10973.43		11040.10		100607 57	
19	11002.34		11069.55		100610 81	54
20	11031.26		11098.95		100614.05	
21	11060.17		11128.44		100617.31	
22	11089.08		11157 89		100620.57	
23	11117 98		11187.34		100623.84	
24	11146.89		11216.8		100627.12	
25	11175.80		11246.25		100630.40	
26	11204.71		11275.71		100633.70	55
27	11233.61		11305.17		100637 0[illegible]	
28	11262.52		11334.63		100640.32	
29	11291.42		11364.09		100643.64	
30	11320 32		11393.56		100646.97	

83. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	99452.18		951436.44		956677.22	
59	99449.14	50	948781.49	44147	954036.86	43904
58	99446.09		946141.15	43905	951411.10	43662
57	99443.03	51	943515.31	43664	948799.84	43421
56	99439.96		940903.84	43425	946202.96	43182
55	99436.88		938306.63	43188	943620.33	42945
54	99433.79		935723.55	42954	941051.84	42710
53	99430.70		933154.50	42721	938497.38	42478
52	99427.59		930599.36	42490	935956.82	42246
51	99424.48		928058.01	4226c	933430.06	42017
50	99421.36	52	925530.35	42033	930916.99	41790
49	99418.23		923016.27	41808	928417.49	41564
48	99415.10		920515.64	41584	925931.45	41341
47	99411.95		918028.38	41362	923458.77	41119
46	99408.80		915554.36	41442	929999.34	40899
45	99405.63		913093.48	40924	918553.05	40681
44	99402.46		910645.64	40707	916119.80	40464
43	99399.28	53	908210.74	40492	913699.48	40249
42	99396.10		905788.67	40279	911292.00	40036
41	99392.90		903379.33	40068	908907.25	39825
40	99389.69		900982.61	39858	906515.12	39615
39	99386.48		898598.43	39680	904145.53	39407
38	99383.26		896226.68	39443	901788.37	39200
37	99380.03		893867.26	39238	899443.54	38995
36	99376.97	54	891520.08	39031	897110.95	38792
35	99373.54		889185.05	38833	894790.51	38590
34	99370.29		886862.06	38633	892482.11	38390
33	99367.03		884551.03	38435	890185.67	38191
32	99363.75		882211.85	38238	887901.08	37994
31	99360.47		879964.46	38042	885628.28	37999
30	99357.19		877688.73	37848	883367.15	37605

6. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	11320.32		11393.56		100646.97	
31	11349.22	482	11423.03	491	100650.31	55
32	11378.12		11452.50		100653.66	
33	11407.02		11481.97		100657.02	56
34	11435.92		11511.44		100660.39	
35	11464.82		11540.92		100663.76	
36	11493.71		11570.39		100667.14	
37	11522.61		11599.87		100670.54	
38	11551.50		11629.35		100673.94	
39	11580.40		11658.84		100677.35	
40	11609.29		11688.32		100680.77	57
41	11638.18		11717.81		100684.19	
42	11667.07	481	11747.30		100687.63	
43	11695.96		11776.79	492	100691.08	
44	11724.85		11806.28		100694.53	
45	11753.74		11835.78		100697.99	
46	11782.63		11865.28		100701.46	
47	11811.51		11894.78		100704.94	58
48	11840.40		11924.28		100708.43	
49	11869.28		11953.78		100711.93	
50	11898.16		11983.29		100715.44	
51	11927.04		12012.79		100718.95	
52	11955.93		12042.30		100722.48	
53	11984.80		12071.82		100726.01	59
54	12013.68		12101.33		100729.55	
55	12042.56		12130.84		100733.10	
56	1207[illegible].43		12160.36		100736.66	
57	12100.31		12189.88		100740.23	
58	12129.19		12219.41		100743.80	
59	12158.06		12248.93		100747.39	
60	12186.93		12278.46		100750.98	60

83. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
30	99357.19		877688.73		883367.15	
29	99353.89	55	875424.61	37655	881117.61	37412
28	99350.58		873171.98	37464	878879.57	37221
27	99347.27		870930.76	37275	876652.95	37031
26	99343.94		868700.88	37086	874437.66	36843
25	99340.62		866482.23	36800	872233.61	36656
24	99337.28		864274.75	36714	870040.71	36471
23	99333.93		862078.33	36530	867858.89	36287
22	99330.57	56	859892.90	36347	865688.05	36105
21	99327.21		857718.38	36167	863528.12	35923
20	99323.84		855554.68	35987	861379.01	35744
19	99320.45		853401.72	35808	859240.65	35565
18	99317.06		851259.43	35631	857112.95	35588
17	99313.67		849127.22	35455	854995.84	35212
16	99310.26		847006.51	35283	852889.23	35038
15	99306.85	57	844895.73	35108	850793.04	34864
14	99303.42		842795.30	34936	848707.21	34692
13	99299.99		840705.15	34765	846631.65	34522
12	99296.55		838655.19	34595	844566.29	34352
11	99293.10		836555.36	34427	842511.05	34184
10	99289.65		834495.57	34260	840465.86	34017
9	99286.19		832445.77	34095	838430.65	33851
8	99282.71	58	830405.86	33930	836405.34	33687
7	99279.22		828375.79	33767	834389.86	33533
6	99275.73		826355.47	33604	832384.15	33362
5	99272.23		824344.85	33444	830388.12	33200
4	99268.73		822343.84	33284	828401 71	33040
3	99265.21		820352.39	33125	826424.85	32882
2	99261.69		818370.41	32967	824457.48	32724
1	99258.16		816397.85	3281	822490.52	32568
0	99254.61		814434.64	32656	820550.90	32412

7. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	12186.93		12278.46		100750 98	
1	12215.81	481	12307.98	492	100754.58	60
2	12244.68		12337.51		100758.20	
3	12273.55		12367.05		100761.82	
4	12302.41		12396.58		100765.45	
5	12331.28		12426.12		100769.08	
6	12360.15		12455.66		100772.73	
7	12389.01		12485.20		100776.39	61
8	12417.88		12514 74		100780.05	
9	12446.74		12544.29		100783.72	
10	12475.60		12573.84		100787.41	
11	12504.46		12603.39	493	100791.10	
12	12533.32		12632.94		100794.80	
13	12562.18		12662.49		100798.50	
14	12591.04		12692.05		100802.22	62
15	12619.90		12721.61		100805.95	
16	12648.75		12751.17		100809.68	
17	12677.61		12780.73		100813.43	
18	12706.46		12810.29		100817.18	
19	12735.31		12839.86		100820.94	
20	12764.16		12869.43		100824.71	
21	12793.01		12899.00		100828.49	63
22	12821.86		12928.58		100832.28	
23	12850.71		12958.15		100836.07	
24	12879.56		12987.73		100839.88	
25	12908.41		13017.31		100843.69	
26	12937.25		13046.90		100847.52	
27	12966.09		13076.48		100851.35	
28	12994.94		13106.07		100855.19	64
29	13023.78		13135.66		100859.04	
30	13052.62		13165.25		100862.90	

82. Grad.

	Sinus	10′	Tangens	10″	Secans	10″
60	99254 61		814434.64		820550.90	
59	99251.07	59	812480.71	32501	818691.57	32258
58	99247.50		810535.99	32348	816681.45	32105
57	99243.94		808600.42	32196	814760.48	31953
56	99240.37		806673.94	32045	812848.60	31802
55	99236.78		804756.47	31895	810945.73	31652
54	99233.19		802847.96	31747	809051.82	31503
53	99229.59	60	800948.35	31599	807166.81	31355
52	99225.99		798057.56	31452	805290.62	31209
51	99222.37		797175.55	31306	803423.21	31063
50	99218.74		795302.24	31162	801564.50	30918
49	99215.11		793437.58	31018	799714.45	30774
48	99211.47		791581.51	30875	797872.98	30631
47	99207.82		789733.96	30733	796040.03	30490
46	99204.16	61	787894.89	3059	794215.56	30349
45	99200.49		786064.23	30453	792399.50	30201
44	99196.82		784241.91	30314	790591.29	30070
43	99193.14		782427.90	30176	788792.38	29933
42	99189.44		780622.12	30039	787001.20	29796
41	99185.74		778824.53	29903	785218.21	29660
40	99182.03		777035.06	29768	783443.35	29525
39	99178.32	62	775253.66	29634	781676.55	29091
38	99174.59		773480.28	29501	779917.78	29257
37	99170.86		771714.86	29369	778166.69	29125
36	99167.12		769957.35	29237	776424.06	28994
35	99163.37		768207.69	29107	774689.01	28863
34	99159.61		766465.84	28977	772966.76	28734
33	99155.82		764731.74	28848	771242.26	28605
32	99152.06	63	763005.33	28720	769530.47	28577
31	99148.28		761286.57	28593	767826.31	28350
30	99144.49		759575.41	28467	866129.76	28223

7. Grad.

	Sinus	10''	Tangens	10''	Secans	10''
30	13052.62		13165.25		100862.90	
31	13081.46	481	13194.84	493	100866.76	64
32	13110.30		13224.44		100870.64	
33	13139.13		13254.04		100874.52	
34	13167.97		13283.64		100878.42	65
35	13196.80		13313.24		100882.32	
36	13225.64		13342.45		100886.23	
37	13254.47		13372.46		100890.15	
38	13283.30		13402.07	494	100894.08	
39	13312.13	380	13431.68		100898.02	
40	13340.96		13461.29		100901.96	
41	13369.79		13490.91		100905.92	66
42	13398 62		13520.53		100909.88	
43	13427.44		13550.15		100913.86	
44	13456.27		13579.78		100917.84	
45	13485.09		13609.40		100921.83	
46	13513.92		13639.03		100925.83	
47	13542.74		13668 66		100929.84	
48	13571.56		13698.30		100933.86	67
49	13600.38		13727.93		100937.88	
50	13629.19		13757.57		100941.99	
51	13658.01		13787.21		100945.96	
52	13686.83		13816.85		100950.01	
53	13715.64		13846.50		100954.08	
54	13744.45		13876.15		100958.19	
55	13773.27		13905.86		100962.23	68
56	13802.08		13935.45		100966.31	
57	13830.89		13965.10		100970.41	
58	13859.70		13994.76		100974.52	
59	13888.50		14024.42		100978.63	
60	13917.31		14054.08		100982.76	

82. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
30	99144.49		759575.42		766129.76	
29	99140.68	6	757871.79	28341	764440.7	28098
28	99136.88		756175.67	28217	762759.23	27973
27	99133.06		754486.99	28093	761085.16	27850
26	99129.23		752805.71	2797	759418.48	27727
25	99125.49	6	751131.77	27848	757759.16	27605
24	99121.55		749465.14	27727	756107.13	27483
23	99117.70		747805.75	27606	754462.36	27363
22	99113.84		746153.57	27486	752824.78	27243
21	99109.97		744508.55	27368	751194.37	27124
20	99106.10		742870.63	27249	749571.06	27006
19	99102.21		741239.78	27132	747954.82	26889
18	99098.32		739615.95	27015	746345.60	26772
17	99094.42		737999.09	2689	744743.35	26656
16	99090.51	65	736389.15	26784	743148.03	26541
15	99086.59		734786.10	26670	741559.58	26426
14	99082.66		733189.89	26556	739978.02	26312
13	99078.73		731600.47	2644	738403.18	26100
12	99074.78		730017.80	26331	736835.12	26088
11	99070.83	66	728441.84	26220	735273.77	25976
10	99066.87		726872.54	26109	733719.09	25865
9	99062.90		725309.87	25900	732171.02	25557
8	99058.93		723753.78	25889	730629.54	25646
7	99054.94		722204.22	25781	729094.60	25537
6	99050.95		720661.16	25672	727566.16	25429
5	99046.94		719124.56	2556	726044.17	25322
4	99042.93	67	717594.37	25459	724528.59	25215
3	99038.91		716070.56	25353	723019.39	25109
2	99034.89		714553.08	25247	721516.53	25004
1	99030.85		713045.90	25143	720019.96	24899
0	99026.81		711536.97	25039	718529.65	24795

8. Grad.

	Sinus	10''	*Tangens*	10''	*Secans*	10''
0	13917.31		14054.08		100982.76	
1	13946.11	480	14083.75	494	100986.89	69
2	13974.92		14113.41		100991.03	
3	14003.72		14143.08	495	100995.18	
4	14032.52		14172.76		100999.34	
5	14061.32		14202.43		101003.51	
6	14090.12		14232.11		101007.69	
7	14118.92		14261.79		101011.87	
8	14147.72		14291.47		101016.07	70
9	14176.51		14321.15		101020.27	
10	14205.31		14350.84		101024.48	
11	14234.10		14380.53		101028.71	
12	14262.89		14410.22		101032.94	
13	14291.68		14439.91		101037.18	
14	14320.47		14469.61		101041.45	
15	14349.26		14499.31		101045.68	71
16	14378.05		14529.01		101049.95	
17	14406.83		14558.72		101054.22	
18	14435.62		14588 42		101058.51	
19	14464.40		14618.13		101062.80	
20	14493.19		14647.84		101067.10	
21	14521.97		14677.56		101071.41	
22	14550.75		14707.27		101075.73	72
23	14579.52		14736.99		101080.06	
24	14608.30		14766.71		101084.40	
25	14637.08		14796.44		101088.75	
26	14665.85		14826.17		101093.10	
27	14694.63		14855.90	496	101097.47	
28	14723.40	479	14885.63		101101.84	73
29	14752.17		14915.36		101106.23	
30	14780.94		14945.10		101110.61	

81. Grad.

	Sinus	10'	*Tangens*	10''	*Secans*	10'''
60	99026.81		711536.97		718529.65	
59	99022.75	67	710038.26	24935	717045.56	24692
58	99018.69		708545.73	24833	715567.64	24589
57	99014.6		707059.34	24731	714095.87	24487
56	99010.55	68	705579.01	24629	712630.19	24386
55	99006.46		704104.8	24528	711170.58	24285
54	99002.37		702636.6	24428	709717.00	24185
53	98998.26		701174.41	24329	708269.41	24095
52	98994.16		699718.05	24230	706827.77	23986
51	98990.03		698257.8	24131	705392.05	23888
50	98985.90		696823.35	24034	703962.20	23790
49	98981.77	69	695384.73	23937	702538.20	23693
48	98977.62		693951.92	23840	701120.01	23596
47	98973.47		692524.89	23744	699707.60	23500
46	98969.31		691103.59	23645	698300.92	23405
45	98965.14		689687.99	23554	696899.94	23310
44	98960.96		688228.07	23460	695504.64	23216
43	98956.77		686873.77	23367	694114.96	23122
42	98952.58	70	685675.08	23273	692730 85	23029
41	98948.38		684081.96	23180	691352.35	22937
40	98944.16		682694.37	23088	689979.42	22845
39	98939.94		681312.27	22997	688611.95	22753
38	98935.71		679935.65	22906	687249.95	22662
37	98931.48		678564.46	22814	685893.38	22572
36	98927.23		677188.67	22726	684542.21	22482
35	98922.98	71	675838.26	22636	683196.43	22393
34	98918.72		674483.18	22548	681855.97	22304
33	98914.45		673133.41	22459	680520.42	22211
32	98910.17		671788.91	22372	679190.95	22128
31	98905.88		670449.66	22285	677866.32	22041
30	98901.59		669115.62	22120	676546.91	21954

8. Grad.

	Sinus	10''	*Tangens*	10''	*Secans*	10'
30	14780.94		14945.10		101110.61	
31	14809.71	479	14974.84	496	101115.01	73
32	14838.48		15004.58		101119.42	
33	14867.24		15034.33		101123.84	
34	14896.01		15064.07		101128.27	
35	14924.77		15093.8[illegible]		101132.70	74
36	14953.53		15123.58		101137.15	
37	14982 30		15153.33		101141.60	
38	15011.05		15183.09		101146.06	
39	15039 81		15212.85		101150.54	
40	15068.57		15242.62		101155.02	
41	15097.33		15272.38		101159.51	
42	15126.08		15302.15		101164.00	75
43	15154.83		15331.92		101168.51	
44	15183.59		15361.69		101173.03	
45	15212.34		15391.47		101177.55	
46	15241.09		15421.25		101182.09	
47	15269.84		15451.03		101186.63	
48	15298.58		15480.82		101191.18	76
49	15327.33		15510.60		101195.74	
50	15356.07		15540.39	497	101200.32	
51	15384.82		15570.19		101204.89	
52	15413.56		15599.98		101209.48	
53	15442.30		15629.78		101214.08	
54	15471.04		15659.58		101218.69	77
55	15499.78		15689.39		101223.30	
56	15528.51		15719.19		101227.93	
57	15557.25		15749.00		101232.56	
58	15585.98		15778.81		101237.20	
59	15614.71		15808.63		101241.85	
60	15643.45		15838.44		101246.51	

81. Grad.

	Sinus	10''	Tangens	10''	Secans	10''
30	98901.59		669115.62		676546.91	
29	98897.28	71	667786.77	22112	675232.68	21868
28	98892.97		666463.07	22027	673923.60	21782
27	98888.65	72	665144.49	21941	672619 65	21697
26	98884.32		665831.00	21856	671320.79	21612
25	98879.98		662522.58	21772	670026.99	21528
24	98875.64		661219.19	21688	668738.22	21445
23	98871.28		659920.80	21605	667454.46	21362
22	98866.92		658627.39	21522	666175.68	21279
21	98862.55		657338.92	21440	664901.84	21196
20	98858.17	73	656055.38	21365	663632.92	21115
19	98853.78		654776.12	21277	662368.90	21033
18	98849.39		653502.93	21196	661109.73	20952
17	98844.98		652233.96	21116	659855.40	20872
16	98840.57		650969.81	21036	658605.87	20782
15	98836.15		649710.43	20957	657361.12	20713
14	98831.72		648455.81	20878	656121.13	20634
13	98827.28	74	647205.91	20799	654885.86	20555
12	98822.84		645960.70	20721	653655.28	20477
11	98818.38		644720.17	20643	652429.38	20399
10	98813.92		643484.28	20566	6512[illegible]8.12	20322
9	98809.45		642253.01	20489	649991.48	20245
8	98804.97		641026.33	20413	648779.43	20169
7	98800.48		639804.22	20337	657571.95	20093
6	98795.91	75	638586.64	20261	646369.01	20018
5	98791.48		637373.59	20186	645170.59	19942
4	98786.97		636165.02	20112	643976.66	19868
3	98782.45		634960.92	20037	642787.19	19794
2	98777.92		633761.26	19964	642787.16	19720
1	98773.38		632566.01	19890	640421.54	19646
0	98768.83		631375.15	19817	639245.32	19573

9. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
0	15643.45		15838.44		101246.51	
1	15672.18	479	15868.26	497	101251.18	78
2	15700.90		15898.05		101255.86	
3	15729.63		15927.91		101260.55	
4	15758.36		15957.74		101265.24	
5	15787.0		15987.57		101269 95	
6	15815.81		16017.46		101274.66	
7	15844.53		16047.24		101289.39	
8	15873.25		16077.08		101284.12	79
9	15901.97		16106.92		101288.86	
10	15930.65		16136.77		101293.61	
11	15959 40		16166.61		101298.37	
12	15988.12		16196.47	498	101303.14	
13	16016.83		16226.22		101307.91	
14	16045.54		16256.17		101312.70	
15	16074.26	478	16286.03		101317.5	80
16	16102.9		16315.90		101322.30	
17	16131.65		16345 76		101327.11	
18	16160.38		16375.63		101331.9	
19	16189.05		16405.50		101336.7	
20	16217.79		16435.37		101341.61	
21	16246.45		16465.25		101346.4	
22	16275.20		16495.13		101351.3	81
23	16303.90		16525.01		101356.18	
24	16332.60		16554.89		101361.06	
25	16361.29		16584.78		101365.95	
26	16389.99		16614.67		101370.84	
27	16418.68		15644.56		101375.74	
28	16447.38		16674.46		101380.66	82
29	16476 07		16704.36		101385.58	
30	16504.76		16734.26		101390.51	

80. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	98768.83		631375.15		639245.32	
59	98764.28	76	630188.66	19745	638073.47	19501
58	98759.72		629006.51	19672	636905.95	19428
57	98755.14		627828.68	19601	635742.76	19357
56	98750.56		626655.14	19529	634583.86	19285
55	98745.98		625485.88	19458	633429.23	19214
54	98741.38		624320.86	19388	632278.84	19144
53	98736.78		623160.07	19317	631132.69	19073
52	98732.16		622003.47	19247	629990.73	19094
51	98727.54	77	620851.06	19178	628852.95	18934
50	98722.91		619702.79	19109	627719.31	18865
49	98718.27		618558.66	19040	626589.84	18796
48	98713.63		617418.65	18972	625464.45	18728
47	98708.97		616282.71	18904	624343.16	18660
46	98704.31		615150.85	18836	623225.94	18592
45	98699.64		614025.03	18769	622112.75	18525
44	98694.96	78	612899.23	18702	621003.59	18458
43	98690.27		611779.42	18636	619898.43	18392
42	98685.57		610663.60	18569	618792.25	18325
41	98680.87		609551.74	18504	617700.02	18260
40	98676.15		608443.81	18438	616606.74	18194
39	98671.43		607339.79	18373	615517.36	18129
38	98666.70		606239.67	18308	614431.89	18064
37	98661.96	79	605143.43	18244	613350.28	17900
36	98657.22		604051.03	18180	612272.53	17936
35	98652 46		602962.47	18116	611198.61	17872
34	98647.70		601877.72	18053	610128.50	17809
33	98642.93		600796 76	17990	609062.19	17746
32	98638.15		599719.57	17927	607999.64	17683
31	98633.36		598649.14	17865	606940.85	17621
30	98628.56	80	597576.44	17803	605885.80	17558

9. Grad.

	Sinus	10″	Tangens	10″	Secans	10′
30	16504.7[illegible]		16734.26		101390.51	
31	16533.45	478	16764.17	498	101395.45	82
32	16562.14		16794.07		101400.40	
33	16590.8[illegible]		16823.98	499	101405.35	
34	16619.51		16853.9		101410.32	
35	16648.19		16883.81		101415.30	83
36	16676.8[illegible]		16913.73		101420.28	
37	16705.5[illegible]		16943.66		101425.28	
38	16734.23		16973.58		101430.28	
39	16762.9		17003.51		101435.30	
40	16791.59		17033.44		101440.32	
41	16820.26		17063.38		101445.35	
42	16848.94		17093.31		101450.39	84
43	16877.61		17123.25		101455.44	
44	16906.28		17153.20		101460.49	
45	16934.95		17183.14		101465.56	
46	16963.62		17213.09		101470.6[illegible]	
47	16992.28		17243.04		101475.7[illegible]	
48	17020.95		14273.00		101480.82	85
49	17049.61		17302.96		101485.9[illegible]	
50	17078.28		17332.92		101491.0[illegible]	
51	17106.94		17362.88		101496.1[illegible]	
52	17135.6[illegible]		17392.85		101501.2[illegible]	
53	17164.25		17422.82	500	101506.4[illegible]	
54	17192.9[illegible]		17452.70		101511.58	
55	17221.56		17482.77		101516.7	86
56	17250.22		17512.7[illegible]		101521.9[illegible]	
57	17278.87		17542.73		101527.08	
58	17307.2[illegible]	477	17572.72		101532.26	
59	17336.1[illegible]		17602.7[illegible]		101537.46	
60	17364.82		17632.70		101542.66	

80. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	98628.56		597576.44		605885.80	
29	98623.75	80	596510.45	17741	604834.45	17497
28	98618.94		595448 15	17679	603786.80	17435
27	98614.12		594389.52	17618	602741.82	17374
26	98609.29		593334.55	17558	601702.50	17313
25	98604.45		592283.22	17497	600665.81	17253
24	98599.60		591235.50	17437	599632.74	17193
23	98594.75	81	590191.38	17377	598603.26	17133
22	98589.88		539150.84	17318	597577.37	17073
21	98585.01		588113.86	17258	596555.04	17014
20	98580.13		587080.42	17199	595536.25	16955
19	98575.24		586050.50	17141	594520.98	16897
18	98570.31		585024.09	17183	593509.22	16838
17	98565.44		584001.17	17025	592500.95	16780
16	98560.53	82	582981.72	16967	591496.14	16723
15	98555.61		581965.72	16909	590494.79	16665
14	98550.68		580953.15	16852	589496.87	16608
13	98545.74		579944.00	16796	588502.37	16551
12	98540.79		578938.25	16739	587511.28	16495
11	98535.83		577935.88	16683	586523.56	16439
10	98530.87		576936.88	16627	585539 20	16383
9	98525.90		575941.22	16571	584558.20	16327
8	98520.92	83	574948.89	16516	583580.53	16272
7	98515.93		573959 88	16461	582606.17	16216
6	98510.93		572974.16	16406	581635.10	16162
5	98505.93		571991.73	16351	580667.32	16107
4	98500.92		571012.56	16297	579702.80	16053
3	98495 89		570036.63	16243	578741.53	15999
2	98490.96		569063.94	16189	577783.49	15945
1	98485.82	84	568094.46	16135	576828.67	15891
0	98480.77		567128.18	16083	575877.05	15838

7. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	13052.62		13165.25		100862.90	
31	13081.46	481	13194.84	493	100866.76	64
32	13110.30		13224.44		100870.64	
33	13139.13		13254.04		100874.52	
34	13167.97		13283.64		100878.42	65
35	13196.8[illegible]		13313.24		100882.32	
36	13225.64		13342.45		100886.23	
37	13254.47		13372.46		100890.15	
38	13283.30		13402.07	494	100894.08	
39	13312.13	380	13431.68		100898.02	
40	13340.96		13461.29		100901.96	
41	13369.79		13490.91		100905.92	66
42	13398 62		13520.53		100909.88	
43	13427.44		13550.15		100913.86	
44	13456.27		13579.78		100917.84	
45	13485.09		13609.40		100921.83	
46	13513.92		13639.03		100925.83	
47	13542.74		13668 66		100929.84	
48	13571.56		13698.30		100933 86	67
49	13600.38		13727.93		100937.88	
50	13629.19		13757.57		100941.99	
51	13658.01		13787.21		100945.96	
52	13686.83		13816.85		100950.01	
53	13715.64		13846.50		100954.08	
54	13744.45		13876.15		100958.19	
55	13773.27		13905.86		100962.23	68
56	13802.08		13935.45		100966.31	
57	13830.89		13965.10		100970.41	
58	13859.70		13994.76		100974.52	
59	13888.50		14024.42		100978.63	
60	13917.31		14054.08		100982.76	

82. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
30	99144.49		759575.42		766129.76	
29	99140.68	63	757871.79	28341	764440.71	28098
28	99136.88		756175.67	28217	762759.23	27973
27	99133.06		754486.99	28093	761085.16	27850
26	99129.23		752805.71	2797.	759418.48	27727
25	99125.49	64	751131.77	27848	757759.16	27605
24	99121.55		749465.14	27727	756107.13	27483
23	99117.70		747805.75	27606	754462.36	27363
22	99113.84		746153.57	27486	752824.78	27243
21	99109.97		744508.55	27368	751194.37	27124
20	99106.10		742870.63	27249	749571.06	27006
19	99102.21		741239.78	27132	747954.82	26889
18	99098.32		739615.95	27015	746345.60	26772
17	99094.42		737999.09	2689.	744743.35	26656
16	99090.51	65	736389.15	26784	743148.03	26541
15	99086.59		734786.10	26670	741559.58	26426
14	99082.66		733189.89	26556	739978.02	26312
13	99078.73		731600.47	2644.	738403.18	26100
12	99074.78		730017.80	26331	736835.12	26088
11	99070.83	66	728441.84	26220	735273.77	25976
10	99066.87		726872.54	26109	733719.09	25865
9	99062.90		725309.87	25900	732171.02	25557
8	99058.93		723753.78	25889	730629.54	25646
7	99054.94		722204.22	25781	729094.60	25537
6	99050.95		720661.16	25672	727566.16	25429
5	99046.94		719124.56	2556.	726044.17	25322
4	99042.93		717594.37	25459	724528.59	25215
3	99038.91	67	716070.56	25353	723019.39	25109
2	99034.89		714553.08	25247	721516.53	25004
1	99030.85		713045.90	25143	720019.96	24899
0	99026.81		711536.97	25039	718529.65	24795

8. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	13917.31		14054.08		100982.76	
1	13946.11	480	14083.75	494	100986.89	69
2	13974.92		14113.41		100991.03	
3	14003.72		14143.08	495	100995.18	
4	14032.52		14172.76		100999.34	
5	14061.32		14202.43		101003.51	
6	14090.12		14232.11		101007.69	
7	14118.92		14261.79		101011.87	
8	14147.72		14291.47		101016.07	70
9	14176.51		14321.15		101020.27	
10	14205.31		14350.84		101024.48	
11	14234.10		14380.53		101028.71	
12	14262.89		14410.22		101032.94	
13	14291.68		14439.91		101037.18	
14	14320.47		14469.61		101041.45	
15	14349.26		14499.31		101045.68	71
16	14378.05		14529.01		101049.95	
17	14406.83		14558.72		101054.22	
18	14435.62		14588.42		101058.51	
19	14464.40		14618.13		101062.80	
20	14493.19		14647.84		101067.10	
21	14521.97		14677.56		101071.41	
22	14550.75		14707.27		101075.73	72
23	14579.52		14736.99		101080.06	
24	14608.30		14766.71		101084.40	
25	14637.08		14796.44		101088.75	
26	14665.85		14826.17		101093.10	
27	14694.63		14855.90	496	101097.47	
28	14723.40	479	14885.63		101101.84	73
29	14752.17		14915.36		101106.23	
30	14780.94		14945.10		101110.61	

81. Grad.

	Sinus	10′	Tangens	10″	Secans	10″
60	99026.81		711536.97		718529.65	
59	99022.75	67	710038.26	24935	717045.56	24692
58	99018.69		708545.73	24833	715567.64	24589
57	99014.6		707059.34	24731	714095.87	24487
56	99010.55	68	705579.0	24629	712630.19	24386
55	99006.46		704104.8	24528	711170.58	24285
54	99002.37		702636.6	24428	709717.00	24185
53	98998.26		701174.41	24329	708269.41	24095
52	98994.16		699718.05	24230	706827.77	23986
51	98990.03		698267.81	24131	705392.05	23888
50	98985.90		696823.35	24034	703962.20	23790
49	98981.77	69	695384.73	23937	702538.20	23693
48	98977.62		693951.92	23840	701120.01	23596
47	98973.47		692524.89	23744	699707.60	23500
46	98969.31		691103.59	23645	698300.92	23405
45	98965.14		689687.99	23554	696899.94	23310
44	98960.96		688228.07	23460	695504.64	23216
43	98956.77		686873.77	23367	694114.96	23122
42	98952.58	70	685675.08	23273	692730 89	23029
41	98948.38		684081.96	23180	691352.35	22937
40	98944.16		682694.37	23088	689979.42	22845
39	98939.94		681312.27	22997	688611.95	22753
38	98935.71		679935.65	22906	687249.95	22662
37	98931.48		678564.46	2281	685893.38	22572
36	98927.23		677188.67	22726	684542.21	22482
35	98922.98	71	675838.26	22636	683196.4	22393
34	98918.72		674483.18	22548	681855.97	22304
33	98914.45		673133.41	2245	680520.42	22211
32	98910.17		671788.91	22372	679190.95	22128
31	98905.88		670449.66	22285	677866.3	22041
30	98901.59		669115.62	22120	676546.91	21954

8. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10′
30	14780.94		14945.1[illegible]		101110.61	
31	14809.7[illegible]	479	14974.84		101115.01	
32	14838.48		15004.58	496	101119.42	73
33	14867.24		15034.33		101123.84	
34	14896.01		15064.07		101128.27	
35	14924.77		15093.82		101132.70	
36	14953.53		15123.58		101137.15	74
37	14982.30		15153.33		101141.60	
38	15011.05		15183.09		101146.06	
39	15039.81		15212.85		101150.54	
40	15068.57		15242.62		101155.02	
41	15097.33		15272.38		101159.51	
42	15126.08		15302.15		101164.00	75
43	15154.83		15331.92		101168.51	
44	15183.59		15361.69		101173.03	
45	15212.34		15391.47		101177.55	
46	15241.09		15421.25		101182.09	
47	15269.84		15451.03		101186.63	
48	15298.58		15480.82		101191.18	76
49	15327.33		15510.60		101195.74	
50	15356.07		15540.39		101200.32	
51	15384.82		15570.19	497	101204.89	
52	15413.56		15599.98		101209.48	
53	15442.30		15629.78		101214.08	
54	15471.04		15659.58		101218.69	77
55	15499.78		15689.39		101223.30	
56	15528.51		15719.19		101227.93	
57	15557.25		15749.00		101232.56	
58	15585.98		15778.81		101237.20	
59	15614.71		15808.63		101241.85	
60	15643.45		15838.44		101246.51	

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81. Grad.

	Sinus	10″	Tangens	10′	Secans	10″
30	98901.59		669115.62		676546.91	
29	98897.28	71	667786.77	22112	675232.68	21868
28	98892.97		666463.07	22027	673923.60	21782
27	98888.65	72	665144.49	21941	672619 65	21697
26	98884.32		665831.00	21856	671320.79	21612
25	98879.98		662522.58	21772	670026.99	21528
24	98875.64		661219.19	21688	668738.22	21445
23	98871.28		659920.8[illegible]	21605	667454.46	21362
22	98866.92		658627.39	21522	666175.68	21279
21	98862.55		657338.92	21440	664901.8[illegible]	21196
20	98858.17	73	656055.38	21365	663632.92	21115
19	98853.78		654776.12	21277	662368.90	21033
18	98849.39		653502.93	21196	661109.73	20952
17	98844.98		652233.96	21116	659855.40	20872
16	98840.57		650969.81	21036	658605.87	20782
15	98836.15		649710.43	20957	657361.12	20713
14	98831.72		648455.81	20878	656121.13	20634
13	98827.28	74	647205.91	20799	654885.86	20555
12	98822.84		645960.70	20721	653655.28	20477
11	98818.38		644720.17	20643	652429.38	20399
10	98813.92		643484.28	20566	6512[illegible]8.12	20322
9	98809.45		642253.01	20489	649991.48	20245
8	98804.97		641026.33	20413	648779.43	20169
7	98800.48		639804.22	20337	657571.95	20093
6	98795.91	75	638,86.64	20261	646369.01	20018
5	98791.48		637373.59	20186	645170.59	19942
4	98786.97		636165.02	20112	643976.66	19868
3	98782.45		634960.92	20037	642787.19	19794
2	98777.92		633761.26	19964	642787.16	19720
1	98773.38		632566.01	19890	640421.54	19646
0	98768.83		631375.15	19817	639245.32	19573

9. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
0	15643.45		15838.44		101246.51	
1	15672.18	479	15868.26	497	101251.18	78
2	15700.90		15898.09		101255.86	
3	15729.63		15927.91		101260.55	
4	15758.36		15957.74		101265.24	
5	15787.0		15987.57		101269 95	
6	15815.81		16017.45		101274.66	
7	15844.53		16047.24		101289.39	
8	15873.25		16077.08		101284.12	79
9	15901.97		16·96.92		101288.86	
10	15930.69		16136.77		101293.61	
11	15959 40		16106.61		101298.37	
12	15988.12		16196.47	498	101303.14	
13	16016.83		16226.22		101307.91	
14	16045.54		16256.17		101312.70	
15	16074.26	478	16286.03		101317.50	80
16	16102.97		16315.90		101322.30	
17	16131.67		16345 76		101327.11	
18	16160.38		16375.63		101331.9	
19	16189.09		16405.50		101336.7	
20	16217.79		16435.37		101341.61	
21	16246.49		16465.25		101346.4	
22	16275.20		16495.13		101351.3	81
23	16303.90		16525.01		101356.18	
24	16332.60		16554.89		101361.06	
25	16361.20		16584.7		101365.95	
26	16389.99		15614.67		101370.8	
27	16418.68		15644.56		101375.7	
28	16447.38		16674.46		101380.6	82
29	16476 07		16704.36		101385.58	
30	16504.76		16734.26		101390.51	

80. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	98768.83		631375.15		639245.32	
59	98764.28	76	630188.66	19745	638073.47	19501
58	98759.72		629006.51	19672	636905.95	19428
57	98755.14		627828.68	19601	635742.76	19357
56	98750.56		626655.14	19529	634583.86	19285
55	98745.98		625485.88	19458	633429.23	19214
54	98741.38		624320.86	19388	632278.84	19144
53	98736.78		623160.07	19317	631132.69	19073
52	98732.16		622003.47	19247	629990.73	19094
51	98727.54	77	620851.06	19178	628852.95	18934
50	98722.91		619702.79	19109	627719.33	18865
49	98718.27		618558.66	19040	626589.84	18796
48	98713.63		617418.65	18972	625464.45	18728
47	98708.97		616282.71	18904	624343.16	18660
46	98704.31		615150.85	18836	623225.94	18592
45	98699.64		514025.03	18769	622112.75	18525
44	98694.96	78	612899.23	18702	621003.59	18458
43	98690.27		611779.42	18636	619898.43	18392
42	98685.57		610663.60	18569	618792.25	18325
41	98680.87		609551.74	18504	617700.02	18260
40	98676.15		608443.81	18438	616606.74	18194
39	98671.43		607339.79	18373	615517.36	18129
38	98666.70		606239.67	18308	614431.89	18064
37	98661.96	79	605143.43	18244	613350.28	17900
36	98657.22		604051.03	18180	612272.53	17936
35	98652 46		602962.47	18116	611198.61	17872
34	98647.70		601877.72	18053	610128.50	17809
33	98642.93		600796 76	17990	609062.19	17746
32	98638.15		599719.57	17927	607999.64	17683
31	98633.36		598649.14	17865	606940.85	17621
30	98628.56	80	597576.44	17803	605885.80	17558

80. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	98628.56		597576.44		605885.80	
29	98623.75	80	596510.45	17741	604834.45	17497
28	98618.94		595448.15	17679	603786.80	17435
27	98614.12		594389.52	17618	602742.82	17374
26	98609.29		593334.55	17558	601702.50	17313
25	98604.45		592283.22	17497	600665.81	17253
24	98599.60		591235.50	17437	599632.74	17193
23	98594.75	81	590191.38	17377	598603.26	17133
22	98589.88		539150.84	17318	597577.37	17073
21	98585.01		588113.86	17258	596555.04	17014
20	98580.13		587080.42	17199	595536.25	16955
19	98575.24		586050.50	17141	594520.98	16897
18	98570.31		585024.09	17183	593509.22	16838
17	98565.44		584001.17	17025	592500.95	16780
16	98560.53	82	582981.72	16967	591496.14	16723
15	98555.61		581965.72	16909	590494.79	16665
14	98550.68		580953.15	16852	589496.87	16608
13	98545.74		579944.00	16796	588502.37	16551
12	98540.79		578938.2[illegible]	16739	587511.28	16495
11	98535.83		577935.88	16683	586523.56	16439
10	98530.87		576936.88	16627	585539.20	16383
9	98525.90		575941.22	16571	584558.20	16327
8	98520.92	83	574948.89	16516	583580.53	16272
7	98515.93		573959.88	16461	582606.17	16216
6	98510.93		572974.16	16406	581635.10	16162
5	98505.93		571991.73	16351	580667.32	16107
4	98500.91		571012.56	16297	579702.80	16053
3	98495.89		570036.63	16243	578741.53	15999
2	98490.96		569063.94	16189	577783.49	15945
1	98485.82	84	568094.46	16135	576828.67	15891
0	98480.77		567128.18	16083	575877.05	15838

10. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	17364.82		17632.70		101542.66	
1	17393.46	477	17662.69	500	101547.87	87
2	17422.11		17692.69		101553.10	
3	17450.75		17722.69		101558.33	
4	17479.39		17752.70		101563.57	
5	17508.03		17782.70		101568.82	
6	17536 67		17812.71		101574.07	
7	17565.31		17842.73		101579.34	
8	17593.95		17872.74		101584.62	88
9	17622.58		17902.76		101589.90	
10	17651.21		17932.78		101595.20	
11	17679.84		17962.81		101600.50	
12	17708.47		17992.84		101605.82	
13	17737.10		18022.87		101611.14	
14	17765.73		18022.91		101616.47	
15	17794.35		18082.95		101621.81	89
16	17822.98		18112.99		101627.16	
17	17851.60		18143.03		101632.52	
18	17880.22		18173.08		101637 89	
19	17908.84		18203.13		101643.27	
20	17937.46		18233.18		101648.65	
21	17966 07		18263.24		101654.05	90
22	17994.69		18293.30	501	101659.46	
23	18023.30		18323.37		101664.87	
24	18051.91		18353.43		101670.29	
25	18080.52		18383.50		101675.73	
26	13109.13		18413.58		101681.17	
27	18137.74		18443.65		101686.62	
28	18166.35		18447.73		101692.08	91
29	18194.95		18503.82		101697.55	
30	18223.55		18533.90		101703.03	

79. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
60	98480.77		567128.18		575877.05	
59	98475.72	84	566165.08	16030	574928.61	15785
58	98470.66		565205.16	15977	573983.33	15733
57	98465.58		564248.38	15424	573041.21	15680
56	98460.50		563294.73	15872	572102.23	15628
55	98455.40		562344.21	15820	571166.36	15576
54	98450.32	85	561396.79	15769	570233.60	15525
53	98445.21		560452.47	15717	569303.93	15473
52	98440.10		559511.21	15666	568377.34	15422
51	98434.98		558573.02	15615	567453.80	15371
50	98429.85		557637.86	15566	566533.31	15320
49	98424.71		556705.74	15514	565615.84	15270
48	98419.56		555776.63	15464	564701.39	15220
47	98414.40	86	554850.52	15414	563789.95	15170
46	98409.24		553927.40	15365	562881.48	15120
45	98404.07		553007.24	15315	561975.99	15170
44	98398 89		552090.04	15266	561073.45	15022
43	98393.70		551175.79	15217	560173.86	14973
42	98388.50		550264.46	15169	559277.16	14924
41	98383.30		549356.04	15120	558383.43	14876
40	98378.08	87	548450.52	15672	557492.58	14828
39	98372.86		547547.88	15024	556604.60	14780
38	98367.63		546648.12	14976	555719.50	14732
37	98362.39		545751.21	14929	554837.26	14684
36	98357.15		544857.15	14881	553957.86	14637
35	98351.89		543966.92	14834	553081.29	14590
34	98346.63		543077.50	14787	552207.54	14543
33	98341.36		542191.88	14741	551336.59	14496
32	98336.08	88	541309.06	14694	550468.43	14450
31	98330 79		540429.00	14648	549603.05	14404
30	98325.49		539551.72	14602	548740.47	14358

10. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	18223.55		18533.90		101703.03	
31	18252.15	477	18563.99	.502	101708.51	96
32	18280.75		18594.09		101714.01	.
33	18309.35		18624.18		101719.52	
34	18337.95		18654.28		101725.03	
35	18366.54		18684.38		101730.56	
36	18395.13		18714.49		101736.09	
37	18423.73	476	18744.60		101741.63	97
38	18452.32		18774.71		101747.19	
39	18480.90		18804.83		101752.75	
40	18509.49		18834.95		101758.32	
41	18538.08		18865.67		101763.90	
42	18566.66		18895.20		101769.49	
43	18595.24		18925.32		101775.08	98
44	18623.82		18955.46		101780.69	
45	18652.40		18985.59		101786.31	.
46	18680.98		19015.73		101791.93	
47	18709.56		19045.87		101797.57	
48	18738.13		19076.02	503	101803.21	
49	18766.70		19106.17		101808.87	99
50	18795.27		19136.32		101814.53	
51	18823.84		19166.48		101820.20	
52	18852.41		19196.64		101825.88	
53	18880.98		19226.80		101831.57	
54	18909.54		19256.96		101837.28	
55	18938.11		19287.13		101842.98	
56	18966.67		19317.31		101848.70	100
57	18995.24		19347.48		101854.43	
58	19023.79		19377.66		101860.17	
59	19052.34		19407.84		101865.91	
60	19080.90		19438.03		101871.67	

79. Grad.

	Sinus	10''	*Tangens*	10''	*Secans*	10''
30	98325.49		539551.72		548740.47	
29	98320.19	88	538677.18	14557	547880.55	14312
28	98314.87		537805.38	14551	547023.42	14269
27	98309.55		536936.30	14466	546169.01	14221
26	98304.22		536069.93	14421	545317.31	14176
25	98298.88	89	535206.26	14377	544468.31	14151
24	98293.53		534345.27	14331	543621.99	14089
23	98288.18		533486.96	14287	542778.35	14042
22	98282.82		532631.31	14242	541937.37	13998
21	98277.44		531778.30	14198	541099.03	13954
20	98272.06		530927.93	14155	540263.33	13910
19	98266.68		530080.18	14111	539430.26	13866
18	98261.28	90	529235.04	14068	538599.79	13823
17	98255.87		528392.51	14024	537771.92	13780
16	98250.46		527552.55	13981	536946.64	13737
15	98245.04		526715.17	13939	536123.93	13694
14	98239.61		525880.35	13896	535303.79	13651
13	98234.17		525048.09	13853	534486.20	13609
12	98228.72		524218.36	13811	533671.14	13567
11	98223.27	91	523391.10	13769	532858.61	13525
10	98217.81		522566.47	13727	532048.60	13483
9	98212.34		521744.28	14686	531241.09	13441
8	98206.86		520924.59	13644	530436.08	13570
7	98201.37		520107.38	13603	529633.54	83359
6	98195.87		519292.64	13562	528833.47	13317
5	98190.37		518480.35	13521	528035.87	13276
4	98184.85		517670.51	13480	527240.70	13236
3	98179.33	92	516863.11	13440	526447.98	13196
2	98173.80		516058.13	13399	525657.68	13156
1	98168.26		515255.56	13359	524869.79	13115
0	98152.72		514455.40	13319	524084.31	13075

11. Grad.

	Sinus	10"	Tangens.	10"	Secans.	10"
0	19080.90		19438.03		101871.67	
1	19109.45	476	19468.22	503	101877.43	96
2	19138.00		19498.41		101883.21	
3	19166.55		19528.61		101888.99	
4	19195.10		19558.81		101894.78	
5	19223.65		19589.01		101900.59	
6	19252.20		19619.22		101906.40	
7	19280.74		19649.43	504	101912.22	97
8	19309.28		49679.64		101918.05	
9	19337.82		19709.86		101923.89	
10	19366.36		19740.08		101929.73	
11	19394.90		19770.31		101935.59	
12	19423.43		19800.53		101941.46	
13	19451.97		19830.76		101947.33	98
14	19480.50		19861.00		101953.22	
15	19509.03	475	19891.24		101959.13	
16	19537.56		19921.48		101965.02	
17	19566.09		19951.72		101970.93	
18	19594.61		19981.97		101976.86	
19	19623.14		20012.22		101982.79	99
20	19651.66		20042.48		101988.73	
21	19680.18		20072.74		101994.68	
22	19708.70		20103.00		102000.64	
23	19737.22		20133.27		102006.61	
24	19765.73		20163.54	505	102012.59	
25	19794.25		20183.81		102018.58	
26	19822.76		20224.09		102024.57	100
27	19851.27		20254.37		102030.58	
28	19879.78		20284.65		102036.60	
29	19908.29		20314.94		102042.62	
30	19936.76		20345.23		102048.66	

78. Grad.

	Sinus	10″	Tangens	10′	Secant	10″
60	98152.72		514455.40		524084.31	
59	93157.16	92	513657.63	13280	523301.21	13035
58	98151.60		512862.24	13240	522520.50	12995
57	98146.03		512069.21	13201	521742.16	12956
56	98140.45	93	511278.55	13161	520966.18	12917
55	98134.86		510490.24	13122	520192.54	12878
54	98129.27		509704.26	13083	519421.25	12839
53	98123.66		508920.61	13045	518652.28	12800
52	98118.05		508139.28	13006	517885.63	12761
51	98112,43		507360.25	12968	517121.28	12723
50	98106.80		506583.52	12930	516359.24	12685
49	98101.16	94	505809.07	12892	515599.48	12647
48	98095.52		505036.90	12854	514841.99	12609
47	98089.86		504267.00	12816	514086.77	12571
46	98081.20		503400.35	12779	513333.81	12534
45	98078.53		509733.95	12741	512583.09	12496
44	98072.85		501970.78	12704	511834.61	12459
43	98067.16		501209.84	12667	511088.35	12422
42	98061.47	95	500451.11	12630	510344.31	12385
41	98055.76		499694.59	12593	509602.48	12349
40	98050.05		498940.27	12557	508862.84	12312
39	98044.33		498188.13	12520	508125.39	12276
38	98038.60		497438.17	12484	507390.12	12239
37	98032.86		499690.37	12448	506657.01	12203
36	98027.12		495944.74	12412	505926.06	12168
35	98021.36	96	495201.25	12377	505197.26	12132
34	98015.60		494459.90	12341	504470.60	12096
33	98009.83		493720.68	12306	503746.07	12061
32	98004.05		492983.58	12270	503023.67	12025
31	97998.27		492248.59	12235	502303.37	11990
30	97992.47		491515.70	12200	501585.17	11955

11. Grad.

	Sinus	10″	Tangens.	10′	Secans.	10″
30	19935.76		20345.23		101048.66	
31	19965.30	475	20375.52	505	102054.70	100
32	19993.80		20405.82		102060.75	101
33	20022.30		20436.12		102066.82	
34	20050.80		20466.43		102072.88	
35	20079.30		20496.74		102078.97	
36	20107.79		20527.05		102085.06	
37	20136.29		20557.37		102091.16	
38	20164.78		20587.69		102097.27	
39	20193.27		20618.02		102103.39	102
40	20221.76		20648.34		102109.52	
41	20250.24		20678.67		102115.66	
42	20278.73		20709.00	506	102121.80	
43	20307.21		20739.34		102127.96	
44	20335.69		20769.68		102134.13	
45	20364.17		20800.03		102140.30	103
46	20392.65		20830.38		102146.49	
47	20421.13		20860.73		102152.68	
48	20449.60		20891.09		102158.88	
49	20478.08	474	20921.45		102165.10	
50	20506.55		20951.81		102171.32	
51	20535.02		20982.18		102177.55	104
52	20563.49		21012.55		102183.79	
53	20591.95		21042.93		102190.04	
54	20620.42		21073.30		102196.30	
55	20648.88		21103.69		102202.57	
56	20677.34		21134.07		102208.85	
57	20705.80		21164.46	507	102215.14	
58	20734.26		21194.86		102221.44	105
59	20762.71		21225.25		102227.74	
60	20791.17		21255.66		102234.06	

78. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
30	97992.47		491515.70		501585.17	
29	97986.67	96	490784.91	12166	500869.07	11921
28	97980.85		490056.20	12131	500155.01	11886
27	97975.03	97	489329.56	12096	499443.1	11851
26	97969.21		488604.99	12062	498733.23	11817
25	97963.37		487882.48	12028	498025.4	11783
24	97957.52		487162.01	11994	497319.64	11749
23	97951.67		486443.59	11960	496615.91	11717
22	97945.81		485727.19	11936	495914.21	11681
21	97939.94		485012.82	11892	495214.53	11651
20	97934.06	98	484300.45	11859	494516.86	11614
19	97928.18		483590.10	11825	493821.20	11581
18	97922.28		482881.73	11792	493127.54	12547
17	97916.38		482175.36	11759	492435.86	11514
16	97910.47		481470.96	11726	491746.16	11481
15	97904.55		480768.54	11693	491058.44	11448
14	97898.62		480068.08	11661	490372.67	11416
13	97892.68	99	479369.57	11628	489688.86	11383
12	97886.74		478673.00	11596	489007.00	12351
11	97880.79		477978.37	11564	488327.07	11319
10	97874.82		477285.67	11532	487649.07	11287
9	97868.86		476594.90	11400	486972.99	1255
8	97862.88		475906.03	11468	486299.83	11223
7	97856.89		475219.07	11436	485626.57	11191
6	97850.90	100	474534.01	11405	484956.2	11160
5	97844.90		473850.83	11373	484287.74	11128
4	97838.88		473169.54	11332	483621.14	11097
3	97832.87		472490.12	11311	482956.43	11066
2	97826.84		471812.56	1280	482293.57	11035
1	97820.80		471136.86	11280	481632.58	11004
0	97814.76		470463.01	11218	480937.43	10673

77. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
60	97814.76		470463.01		480937.43	
59	97808.71	100	469791.00	11187	480316.13	10942
58	97802.65	101	469120.83	11157	479660.66	10912
57	97796.58		468452.48	11126	479007.02	10881
56	97790.50		467785.95	11096	478355.20	10851
55	97784.42		467121.24	11066	477705.19	10821
54	97778.32		466458.32	11036	477056.95	10791
53	97772.22		465797.21	11006	476410.57	10761
52	97766.11		465137.88	11976	475765.96	10731
51	97759.99	102	464480.34	10947	475123.12	10702
50	97753.81		463824.56	10917	474482.06	10672
49	97747.73		463170.56	10888	473842.77	10643
48	97741.59		562518.32	10859	473205.23	10613
47	97735.44		461867.83	10829	472569.45	10584
46	97729.28		461219.08	10800	471935.42	10555
45	97723.11		460572.07	10771	471303.12	10526
44	97716.93	103	459926.80	10743	470672.56	10497
43	97710.75		459283.24	10714	470043.72	10469
42	97704.56		458641.41	10685	469416.60	10420
41	97698.36		458001.29	10657	468791.19	10412
40	97692.15		457362.87	10629	468167.48	10383
39	97685.93		456726.14	10600	467546.48	10355
38	97679.70		456091.11	10572	466925.16	10327
37	97673.47	104	455457.7	10544	466306.52	10299
36	97667.23		454826.0	10517	465689.56	10271
35	97660.98		454196.07	10489	465074.27	10243
34	97654.72		453567.73	10461	464460.64	10216
33	97648.45		452941.0[illegible]	10433	463848.67	10188
32	97642.18		452316.0[illegible]	10406	463238.35	10161
31	97635.89		451692.61	10379	462629.67	10133
30	97629.60		452070.85	10351	462022.63	10106

12. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	21643.96		22169.47		102427.95	
31	21672.36	473	22199.99	509	102434.56	110
32	21700.76		22230.51		102441.18	
33	21729.15		22261.04		102447.81	
34	21757.54		22291.57		102454.45	
35	21785.93		22322.11		102461.30	
36	21814.32		22352.65		102467.75	111
37	21842.71		22383.19		102474.42	
38	21871.10		22413.74		102481.10	
39	21899.48		22444.29		102487.79	
40	21927.86		22474.85		102494.58	
41	21956.24		22505.41		102501.19	
42	21984.62		22535.97		102507.90	112
43	22013.00		22566.54		102514.63	
44	22041.37		22597.11	510	102521.36	
45	22069.73		22627.69		102528.10	
46	22098.11		22658.27		102534.86	
47	22126.48		22688.85		102541.62	
48	22154.85		22719.44		102548.39	
49	22183.21		22750.03		102555.18	113
50	22211.58		22780.63		102561.97	
51	22239.94		22811.23		102568.77	
52	22268.30		22841.84		102575.58	
53	22296.66		22872.44		102582.40	
54	22325.01		22903.06		102589.23	
55	22353.36		22933.67		102596.07	114
56	22381.72		22964.29		102602.92	
57	22410.07	472	22994.92		102609.78	
58	22438.41		23025.55	411	102616.64	
59	22466.76		23056.18		102623.52	
60	22495.10		23086.82		102630.41	

77. Grad.

	Sinus	10″	Tangens	10′	Secans	10″
30	97629.60		451070.85		462022.63	
29	97623.30	105	450450.72	10324	461417.22	10079
28	97616.99		449832.21	10297	460813.43	10052
27	97610.68		449215.32	10270	460211.26	10025
26	97604.35		448600.04	10244	459610.70	9998
25	97598.02		447986.36	10217	459011.74	9971
24	97591.68		447374.28	10190	458414.39	9945
23	97585.33		446763.79	10164	457813.62	9918
22	97578.97	106	446154.89	10137	457224.44	9893
21	97572.60		445547.56	10111	456631.83	9866
20	97566.23		444941.81	10085	456040.80	9840
19	97559.84		444337.62	10059	455451.34	9814
18	97553.45		443734.99	10033	454863.44	9788
17	97547.05		443133.92	10007	454277.09	9762
16	97540.65		442534.39	9981	453692.29	9736
15	97534.23	107	441936.41	9956	453109.03	9710
14	97527.83		441339.96	9930	452527.30	9685
13	97521.38		440745.04	9905	451947.11	9659
12	97514.93		440151.64	9879	451368.44	9634
11	97508.49		439559.76	9854	450791.29	9609
10	97502.03		438969.40	7829	450215.65	9584
9	97495.56		438380.54	9804	449641.52	9558
8	97489.09		437793.17	9779	449068.89	9533
7	97482.61	108	437207.31	9754	448497.75	9509
6	97476.12		436622.93	9729	447928.10	9484
5	97469.62		436040.03	9705	447359.93	9459
4	97463.11		435458.61	9680	446793.84	9435
3	97456.60		434878.66	9656	446228.03	9410
2	97450.08		434300.18	9631	445664.28	9386
1	97443.55		433723.16	9607	445101.98	9361
0	97437.01	109	433147.59	9583	444541.15	9337

13. Grad.

	Sinus	10′	Tangens	10′	Secans	10′
0	22495.10		23086.82		102630.41	
1	22523.45	472	23117.46	513	102637.31	115
2	22551.79		23148.11		102644.21	
3	22580.13		23178.75		102651.13	
4	22608.46		23209.41		102658.06	
5	22636.80		23240.07		102664.99	
6	22665.13		23270.73		102671.94	
7	22693.46		23301.39		102678.89	116
8	22721.79		23332.06		102685.86	
9	22750.12		23362.74		102692.83	
10	22778.44		23393.42		102699.81	
11	22806.77		23424.10		102706.81	
12	22835.09		23454.79		102713.81	
13	22863.41		23485.48	512	102720.82	117
14	22891.72		23516.17		102727.8	
15	22920.04		23546.87		102734.83	
16	22948.35		23577.58		102741.92	
17	22976.66		23608.29		102748.97	
18	23004.97		23639.00		102756.03	
19	23033.28		23669.71		102763.10	
20	23061.59		23700.43		102770.18	118
21	23089.89		23731.16		102777.27	
22	23118.19		23761.89		102784.37	
23	23146.49		23792.62		102791.43	
24	23174.79		23823.36		102798.60	
25	23203.09		23854.10		102805.73	
26	23231.38		23884.85		102812.87	119
27	23259.67		23915.60	513	102820.02	
28	23287.96	471	23946.35		102827.17	
29	23316.25		23977.11		102834.34	
30	23344.54		24007.88		102841.52	

76. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	97437.01		433147.59		444541.15	
59	97430.46	109	432573.47	9559	443981.76	9313
58	97423.90		432000.79	9535	443423.82	9289
57	97417.34		431429.55	9511	442867.31	9265
56	97410.77		430859.74	9487	442312.24	9241
55	97404.90		430291.36	9463	441758.59	9218
54	97397.60		429724.40	9439	441206.37	9194
53	97391.00	110	429158 85	9416	440655.56	9170
52	97384.39		428594.72	9392	440106.16	9157
5	97377.78		428031.99	9369	439558.17	9123
50	97371.16		427470.66	9346	439011.58	9100
49	97364.53		426910.72	9323	438466.38	9077
48	97357.89		426352.18	9299	437922.57	9054
47	97351.24		425795.70	9276	437380.15	9031
46	97344.59	111	425239.23	9254	436839.10	9008
45	97337.93		424684.82	9231	436299.43	8985
44	97331.25		424131.77	9208	435761.13	8962
43	97324.57		423580.09	9185	435224.19	8940
42	97317.89		423029.77	9163	434688 61	8917
41	97311.19		422480.80	9140	434154.38	8894
40	97104 49		421933.18	9118	433621.50	8872
39	97297.77		421386.90	9095	433089.96	8850
38	97291.05	12	420841.95	9073	432559.77	8827
37	97284.34		420298.34	9051	432030.90	8805
36	97277.59		419756.06	9029	431503.36	8783
35	97270 84		419215.10	9007	430977.15	8761
34	97264.09		418675.46	8985	430452.25	8739
33	97257.33		418137.13	8963	429928.67	8717
32	97250.16		417600. 11	8941	429406.40	8695
31	97243.78	113	417064.40	8920	428885.43	8674
30	97236.99		416529 98	8898	428365.76	8652

13. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	23344.54		24007.88		102841.52	
31	23372.82	471	24038.64	513	102848.71	119
32	23401.10		24069.41		102855.90	120
33	23429.38		24100.19		102863.11	
34	23457.66		24130.97		102870.32	
35	23485.94		24161.76		102877.55	
36	23514.21		24192.55		102884.79	
37	23542.48		24223.34		102892.03	
38	23570.75		24254.14		02899.29	121
39	23599.02		24284.94		102906.55	
40	23627.29		24315.75		102913.83	
41	23655.55		24346.56	514	102921.11	
42	23683.81		24377.37		102928.40	
43	23712.07		24408.19		102935.71	
44	23740.33		24439.02		102943.02	122
45	23768.59		24469.84		102950.34	
46	23796.84		24500.68		102957.68	
47	23825.10		24531.51		02965.02	
48	23853.35		24562.36		102972.37	
49	23881.59		24 93.50		102979.73	
50	23909.84		24624.05		102987.11	123
51	23938.08		24654.91		102994.49	
52	23966.33		2468[illegible]		103001.88	
53	23994.57		24716.63		103009.28	
54	24022.80		24747.[illegible]		103016.69	
55	24051.04		24778.37	515	103 24.11	
56	24079.27		24809.25		103031.54	
57	28107.51		24840.13		1[illegible]3[illegible]38.98	124
58	24135.74	470	24871.01		103046.43	
59	24162.96		24901.90		103053.89	
60	24192.19		24932.80		103061.36	

76. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	97236.99		416529.98		428365.76	
29	97230.20	113	415996.85	8876	427847.38	8631
28	97223.39		415465.01	8855	427330.29	8609
27	97216.58		414934.46	8834	426814.49	8658
26	97209.76		414405.19	8812	426299.96	8567
25	97202.94		413877.19	8791	425786.71	8545
24	97196.10	114	413350.46	8770	425274.74	8524
23	97189.26		412824.99	8749	424764.02	8503
22	97182.40		412300.79	8728	424254.57	8480
21	97175.54		411777.84	8707	423746.37	8460
20	97168.67		411256.14	8686	423239.43	8440
19	97161.80		410735.69	8666	422733.73	8420
18	97154.91		410216.49	8645	422229.28	8399
17	97148.02		409698.51	8624	421726.06	8378
16	97141.12	115	409181.78	8604	421224.08	8358
15	97134.21		408666.27	8583	430723.33	8337
14	97127.21		408151.98	8563	420223.80	8317
13	97120.36		407638.92	8543	419725.49	8297
12	97113.43		407127.07	8522	419228.40	8276
11	97106.48		406616.43	8502	418732.52	8256
10	97099.53		406107.00	8482	418237.85	8236
9	97092.57	116	405598.77	8462	417744.37	8216
8	97085.61		405091.74	8442	417252.10	8196
7	97078.63		404585.90	8422	416761.02	8176
6	97071 65		404081.25	8403	416271.13	8157
5	97064.66		403577.79	8382	415782.45	8137
4	97057.66		403075.50	8363	415294.91	8117
3	97050.65		402574.40	8344	414808.56	8078
2	97043 63	117	402074.46	8324	414323.39	8078
1	97036.61		401575.70	8305	413839.39	8059
0	97029.57		401078.09	8285	413356.55	8039

14. Grad.

′	Sinus	10″	Tangens	10″	Secans	10″
0	24192.19		24932.80		103061.36	
1	24220.41	470	24963.70	515	103068.84	124
2	24248.63		24994.60		103076.33	
3	24276.85		25025.51		103083.83	125
4	24305.07		25056.42		103091.34	
5	24333.29		25087.34		103098.86	
6	24361.50		25118.26		103106.39	
7	24389.71		25149.19		103113.93	
8	24417.92		25180.12	516	103120.47	
9	24446.13		25211.06		103129.03	126
10	24474.33		25242.00		103136.60	
11	24502.54		25272.94		103144.18	
12	24530.74		25305.89		103151.77	
13	24558.94		25334.84		103159.36	
14	24587.13		25365.80		103166.97	
15	24615.33		25396.76		103174.59	127
16	24643.52		25427.73		103182.21	
17	24671.71		25458.70		103189.85	
18	24699.90		25489.68		103197.50	
19	24728.09		25520.66		103205.16	
20	24756.27		25551.65		103212.82	
21	24784.45		25582.64	517	103220.50	128
22	24812.63		25613.63		103228.18	
23	24840.81		25644.63		103235.88	
24	24868.99		25675.64		103243.59	
25	24897.16		25706.64		103251.30	
26	24925.33	469	25737.66		103259.03	
27	24953.50		25768.68		103266.76	129
28	24981.67		25799.70		103274.51	
29	25009.84		25830.73		103282.27	
30	25038.00		25861.76		103290.03	

75. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
60	97029.57		401078.09		413356.55	
59	97022.53	117	400581.65	8266	412874.87	8020
58	97015.48		400086.36	8247	412394.35	8001
57	97008.42		399592.25	8228	411914.98	7982
56	97001.36		399099.24	8209	411436.75	7962
55	96994.28	118	398607.39	8189	410959.67	7943
54	96987 20		398116.69	8171	410483.73	7924
53	96980.11		397627.12	8152	410008.93	7906
52	96973.01		397138.68	8133	409535.26	7887
51	96965.90		396651.36	8114	409062.72	7868
50	96958.79		396165.18	8095	408591.30	7849
49	96951.67		395680.11	8077	408120.99	7831
48	96944.53		395196.15	8058	407651.81	7812
47	96937.39	119	394713.31	8040	407183.74	7794
46	96930.25		394231.57	8020	406716.77	7775
45	96923.09		393750.94	8003	406250.91	7757
44	96915.93		393271.41	7985	405786.15	7738
43	96908.75		392792.97	7966	405322.49	7720
42	96901.57		392315 63	7948	404859.92	7702
4	96894.38		391839.37	7930	404398.44	7684
40	96887.19	120	391364.20	7912	403938.04	7666
39	96879.98		390890.11	7894	403478.72	7648
38	96872.77		390417.10	7876	403020.48	7630
37	96865.55		389945.16	7858	402563.32	7612
36	96858.32		389474 28	7840	402107.22	7594
35	96851.08		389004.48	7823	401652.19	7576
34	96843.83		388535.74	7805	401198.23	7559
33	96836.58	121	388068.05	7787	400745.32	7541
32	96829.31		387601.42	7770	400293.47	7524
31	96822,04		387235.84	7753	399842.67	7506
30	96814.76		386671.31	7735	399392.92	7589

14. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	25038.00		25861.76		103290.03	
31	25066.16	469	25892.79	517	103297.81	129
32	25094.32		25923.84		103305.59	
33	25122.48		25954.88		103313.39	130
34	25150.63		25985 93	518	103321. 19	
35	25178.78		26016.99		103329. 01	
36	25206.9		26048.05		103336.83	
37	25235.08		26079.11		103344.67	
38	25263.2		26110.18		103352.51	
39	25291.37		26141.26		103360.37	131
40	25319.52		26172.34		103368.23	
41	25347.66		26203.42		103376.11	
42	25375.79		26234.51		103383.99	
43	25403.92		26265.60		103391.88	
44	25432.06		26296.70		103399 79	
45	25460.19		26327.80		103407.70	132
46	25488.32		26358.91		103415.63	
47	25516.45		26390.02	519	103423.56	
48	25544 58		26421.14		103431.51	
49	25572.70		26452.26		103439.46	
50	25600.82		26483.39		103447.43	
51	25628.94		26514.52		103455.40	133
52	25657.05		26545.66		103463.38	
53	25685.17		26576.80		103471.38	
54	25713.28		26607.94		103479.38	
55	25741.39	468	26639.09		103487.40	
56	25769 50		26670.25		103495.42	
57	25797.60		26701.41		103503.45	134
58	25825.70		26732.57		103511.50	
59	25853.81		26763.74	520	103519.55	
60	25881.90		26794.92		103527.62	

75. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	96814.76		386671.31		399392 92	
29	96807.48	121	386207.82	7718	398944.21	7471
28	96800.18		385745.37	7700	398496.54	7454
27	96792.88		385283.96	7683	398049.91	7437
26	96785.56		384823.58	7666	397604.51	7419
25	96778.24	122	384364.23	7649	397159.75	7402
24	96770.91		383905.91	7632	396716.21	7385
23	96763.58		383448.61	7615	396273.69	7368
22	96756.24		382992.33	7598	395832.19	7351
21	96748.88		382537.07	7581	395391.71	7334
20	96741,52		382082.81	7564	394952.24	7317
19	96734.15		381629.57	7547	394513.78	7301
18	96726.77	123	381177.33	7530	394076.33	7284
17	96711.35		380726.09	7514	393639.88	7267
16	96722.99		380275.85	7497	393204.43	7251
15	96704.59		379826.61	7481	392769.97	7234
14	96697.18		379378.35	7464	392336.51	7218
13	96689.76		378931.09	7445	391904.03	7201
12	96682.34		378484.81	7431	391472.54	7185
11	96674.90	124	378039.51	7415	391042.03	7168
10	96667.46		377595.19	7399	390612.50	7152
9	96660.01		377151.85	7382	390183.95	7136
8	96652.55		376709.47	7366	389756.39	7120
7	96645.08		376268.07	7350	389329.76	7103
6	96637.61		375827.63	7334	388904.11	7087
5	96630.12		375388.15	7318	388479.43	7071
4	96622.63		374949.63	7302	388055.70	7055
3	96915.13	125	374512.07	7286	387632.93	7040
2	96607.62		374075.46	7270	387211.12	7024
1	96000.11		373639.80	7254	386790.25	7008
0	96592.58		373205.08	7239	386370.33	6992

15. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	25881.90		26794.92		103527.62	
1	25910.00	468	26826.10	520	103535.70	134
2	25938.09		26857.28		103543.78	
3	25966.15		26888.47		103551.85	135
4	25994.28		26919.67		103559.97	
5	26022.36		26950.87		103568.09	
6	26050.45		26982.07		103576.21	
7	26078.55		27013.28		103584.35	
8	26106.61		27044.49		103592.49	
9	26134.69		27075.71		103600.65	136
10	26162.77		27106.94		103608.81	
11	26190.85		27138.16	521	103616.99	
12	26218.92		27169.40		103625.16	
13	26246.99		27200.64		103633.37	
14	26275.06		27231.88		103641.57	
15	26303.12		27263.13		103649.79	137
16	26331.18		27394.68		103658.01	
17	26359.25		27325.64		103666.25	
18	26387.30		27356.90		103674.49	
19	26415.36		27388.17		103682.75	
20	26443.42		27419.45		103691.01	
21	26471.47		27450.72		203699.29	138
22	26499.52	467	27482.01		103707.57	
23	26527.57		27513.30	522	103715.87	
24	26555.61		27544.59		103724.17	
25	26583.65		27575.89		103732.49	
26	26611.70		27607.19		103740.82	
27	26639.73		27638.50		103749.15	139
28	26667.77		27669.81		103757.50	
29	26695.81		27701.13		103765.85	
30	26723.84		27732.45		103774.22	

74. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	96592.58		373205.08		386370.33	
59	96585.05	125	372771.31	7227	385951.35	6976
58	96577 51		372338.47	7207	385533.32	6961
57	96569.96		371906.58	7192	385116.22	6945
56	96562.40	126	371475.61	7176	384700.05	6930
55	96554.84		371045.58	7161	384284.82	6914
54	96547.26		370646.48	7145	383870.51	6899
53	96539.68		370188.29	7130	383457.13	6883
52	96532.09		369761.03	7115	383044.67	6868
51	96524.49		369334.69	7099	382633.13	6853
50	96516.89		368909.27	7084	382222.51	6837
49	96509 27	127	368484.75	7069	381812.80	6822
48	96501.65		368061.15	7054	381403.99	6807
47	96494.02		367638.45	7039	380996.10	6792
46	96486.38		367216.65	7024	380589.11	6777
45	96478.73		366795.75	7009	380183.01	6762
44	96471.08		366375.75	6994	379777.82	6747
43	96463.41		365956.65	6979	379373.52	6732
42	96455.75		365538.43	6964	378970.11	6717
41	96448.06	128	365121.11	6949	378567.60	6702
40	96440.37		364704.67	6935	378165.96	6688
39	96432.68		364289.11	692.	377765.22	6673
38	96424.97		363874.44	690(	377365.35	6658
37	96417.26		363460.64	6891	376966.36	6644
36	96409.54		363047.71	6876	376568.24	6629
35	96401.81		362635.65	6862	376171.00	6615
34	96394.07	129	362224.47	6847	375774.62	6600
33	96383.33		361814.15	6833	375379.11	6586
32	96378.58		361404.69	6818	374984.47	6571
31	96370.81		360996 09	6804	374590.68	6557
30	96363.04		360588.35	6790	374197.75	6543

13. Grad.

	Sinus	10′	Tangens	10′	Secans	10″
0	22495.10		23086.82		102630.41	
1	22523.45	472	23117.46		102637.31	115
2	22551.79		23148.11	511	102644.21	
3	22580.13		23178.75		102651.13	
4	22608.46		23209.41		102658.06	
5	22636.80		23240.07		102664.99	
6	22665.13		23270.73		102671.94	
7	22693.46		23301.39		102678.89	116
8	22721.79		23332.06		102685.86	
9	22750.12		23362.74		102692.83	
10	22778.44		23393.42		102699.81	
11	22806.77		23424.10		102706.81	
12	22835.09		23454.79		102713.81	
13	22863.41		23485.48	512	102720.82	117
14	22891.72		23516.17		102727.8	
15	22920.04		23546.87		102734.88	
16	22948.35		23577.58		102741.92	
17	22976.66		23608.29		102748.97	
18	23004.97		23639.00		102756.03	
19	23033.28		23669.71		102763.10	
20	23061.59		23700.43		102770.18	118
21	23089.89		23731.16		102777.27	
22	23118.19		23761.89		102784.37	
23	23146.49		23792.62		102791.48	
24	23174.79		23823.36		102793.60	
25	23203.09		23854.10		102805.73	
26	23231.38		23884.85		102812.87	119
27	23259.67		23915.60	513	102820.02	
28	23287.96	471	23946.35		102827.17	
29	23316.25		23977.11		102834.34	
30	23344.54		24007.88		102841.52	

76. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	97437.01		433147.59		444541.15	
59	97430.46	109	432573.47	9559	443981.76	9313
58	97423.90		432000.79	9535	443423.82	9289
57	97417.34		431429.55	9511	442867.31	9265
56	97410.77		430859.74	9487	442312.24	9241
55	97404.90		430291.36	9463	441758.59	9218
54	97397.60		429724.40	9439	441206.37	9194
53	97391.00	110	429158 85	9416	440655.56	9170
52	97384.39		428594.72	9392	440106.16	9157
51	97377.78		428031.99	9369	439558.17	9123
50	97371.16		427470.66	9346	439011.58	9100
49	97364.53		426910.72	9323	438466.38	9077
48	97357.89		426352.18	9299	437922.57	9054
47	97351.24		425795.70	9276	437380.15	9031
46	97344.59	111	425239.23	9254	436839.10	9008
45	97337.93		424684.82	9231	436299.43	8985
44	97331.25		424131.77	9208	435761.13	8962
43	97324.57		423580.09	9185	435224.19	8940
42	97317.89		423029.77	9163	434628 61	8917
41	97311.19		422480.80	9140	434154.38	8894
40	97304 49		421933.18	9118	433621.50	8872
39	97297.77		421386.90	9095	433089.96	8850
38	97291.05	12	420841.95	9073	432559.77	8827
37	97284.34		420298.54	9051	432030.90	8805
36	97277.59		419756.06	9029	431503.36	8783
35	97270 84		419215.10	9007	430977.15	8761
34	97264.09		418675.46	8985	430452.25	8739
33	97257.33		418137.13	8963	429928.67	8717
32	97250.16		417600.11	8941	429406.40	8695
31	97243.78	113	417964.40	8920	428885.43	8674
30	97236.99		416529 98	8898	428365.76	8652

13. Grad.

	Sinus	10″	Tangens	10″	Secans	10′
30	23344.54		24007.88		102841.52	
31	23372.82	471	24038.64	513	102848.71	119
32	23401.10		24069.41		102855.90	120
33	23429.38		24100.19		102863.11	
34	23457.66		24130.97		102870.32	
35	23485.94		24161.76		102877.55	
36	23514.21		24192.55		102884.79	
37	23542.48		24223.34		102892.03	
38	23570.75		24254.14		102899.29	121
39	23599.02		24284.94		102906.55	
40	23627.29		24315.75		102913.83	
41	23655.55		24346.56	514	102921.11	
42	23683.81		24377.37		102928.40	
43	23712.07		24408.19		102935.71	
44	23740.33		24439.02		02943.02	122
45	23768.59		24469.84		102950.34	
46	23796.84		24500 68		102957.68	
47	23825.10		24531.51		02965.02	
48	23853.35		24562.36		102972.37	
49	23881.59		24 93.50		102979.73	
50	23909.84		24624.05		102987.11	123
51	23938.08		24654 91		102994.49	
52	23966.33		24685.76		103001.88	
53	23994.57		24716.63		103009.28	
54	24022.80		24747.50		103016.69	
55	24051.04		24778.37	515	103 24.11	
56	24079.27		24809.25		103031.54	
57	28107.51		24840.13		103038.98	124
58	24135.74	470	24871.01		103046.43	
59	24162.96		24901.90		103053.89	
60	24192.19		24932 80		103061.36	

76. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	97236.99		416529.98		428365.76	
29	97230.20	113	415996.85	8876	427847.38	8631
28	97223.39		415465.01	8855	427330.29	8609
27	97216.58		414934.46	8834	426814.49	8658
26	97209.76		414405.19	8812	426299.96	8567
25	97202.94		413877.19	8791	425786.71	8545
24	97196.10	114	413350.46	8770	425274.74	8524
23	97189.26		412824.99	8749	424764.02	8503
22	97182.40		412300.79	8728	424254.57	8480
21	97175.54		411777.84	8707	423746.37	8460
20	97168.67		411256.14	8686	423239.43	8440
19	97161.80		410735.69	8666	422733.73	8420
18	97154.91		410216.49	8645	422229.28	8399
17	97148.02		409698.51	8624	421726.06	8378
16	97141.12	115	409181.78	8604	421224.08	8358
15	97134.21		408666.27	8583	430723.33	8337
14	97127.21		408151.98	8563	420223.80	8317
13	97120.36		407638.92	8543	419725.49	8297
12	97113.43		407127.07	8522	419228.40	8276
11	97106.48		406616.43	8502	418732.52	8256
10	97099.53		406107.00	8482	418237.85	8236
9	97092.57	116	405598.77	8462	417744.37	8216
8	97085.61		405091.74	8442	417252.10	8196
7	97078.63		404585.90	8422	416761.02	8176
6	97071 65		404081.25	8403	416271.13	8157
5	97064.66		403577.79	8382	415782.45	8137
4	97057.66		403075.50	8363	415294.91	8117
3	97050.65		402574.40	8344	414808.56	8078
2	97043 63	117	402074.46	8324	414523.39	8078
1	97036.61		401575.70	8305	413839.39	8059
0	97029.57		401078.09	8285	413356.55	8039

14. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	24192.19		24932.80		103061.36	
1	24220.41	470	24963.70	515	103068.84	124
2	24248.63		24994.60		103076.33	
3	24276.85		25025.51		103083.83	125
4	24305.07		25056.42		103091.34	
5	24333.29		25087.34		103098.86	
6	24361.50		25118.26		103106.39	
7	24389.71		25149.19		103113.93	
8	24417.92		25180.12	516	103120.47	
9	24446.13		25211.06		103129.03	126
10	24474.33		25242.00		103136.60	
11	24502.54		25272.94		103144.18	
12	24530.74		25305.89		103151.77	
13	24558.94		25334.84		103159.36	
14	24587.13		25365.80		103166.97	
15	24615.33		25396.76		103174.59	127
16	24643.52		25427.73		103182.21	
17	24671.71		25458.70		103189.85	
18	24699 90		25489.68		103197.50	
19	24728.09		25520.66		103205.16	
20	24756.27		25551.65		103212.82	
21	24784.45		25582.64	517	103220.50	128
22	24812.63		25613.63		103228.18	
23	24840.81		25644.63		103235.88	
24	24868.99		25675.64		103243.59	
25	24897.16		25706.64		103251.30	
26	24925.33	469	25737 66		103259 03	
27	24953.50		25768.68		103266.76	129
28	24981.67		25799.70		103274.51	
29	25009 84		25830.73		103282.27	
30	25038.00		25861.76		103290.03	

75. Grad.

	Sinus	10"	Tangens.	10'	Secans.	10"
60	97029.57		401078.09		413356.55	
59	97022.53	117	400581.65	8266	412874.87	8020
58	97015.48		400086.36	8247	412394.35	8001
57	97008.42		399592.25	8228	411914.98	7982
56	97001.36		399099.24	8209	411436.75	7962
55	96994.28	118	398607.39	8189	410959.67	7943
54	96987 20		398116.69	8171	410483.73	7924
53	96980.11		397627.12	8152	410008.93	7906
52	96973.01		397138.68	8133	409535.26	7887
51	96965.90		396651.36	8114	409062.72	7868
50	96958.79		396165.18	8095	408591.30	7849
49	96951.67		395680.11	8077	408120.99	7831
48	96944.53		395196.15	8058	407651.81	7812
47	96937.39	119	394713.31	8040	407183.74	7794
46	96930.25		394231.57	8020	406716.77	7775
45	96923.09		393750.94	8003	406250.91	7757
44	96915.93		393271.41	7985	405786.15	7738
43	96908.75		392792.97	7966	405322.49	7720
42	96901.57		392315 63	7948	404859.92	7702
4	96894.38		391839.37	7930	404398.44	7684
40	96887.19	120	391364.20	7912	403938.04	7666
39	96879.98		390890.11	7894	403478.72	7648
38	96872.77		390417.10	7876	403020.48	7630
37	96865.55		389945.16	7858	402563.32	7612
36	96858.32		389474 28	7840	402107.22	7594
35	96851.08		389004.48	7823	401652.19	7576
34	96843.83		388535.74	7805	401198.23	7559
33	96836.58	121	388068.05	7787	400745.32	7541
32	96829.31		387601.42	7770	400293.47	7524
31	96822,04		387235.84	7753	399842.67	7506
30	96814.76		386671.31	7735	399392.92	7589

14. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	25038.00		25861.76		103290.03	
31	25066.16	469	25892.79	517	103297.81	129
32	25094.32		25923.84		103305.59	
33	25122.48		25954.88		103313.39	130
34	25150.63		25985 93	518	103321. 19	
35	25178.78		26016.99		103329. 01	
36	25206.9		26048.05		103336.83	
37	25235.08		26079.11		103344.67	
38	25263.2		26110.18		103352.51	
39	25291.3		26141.26		103360.37	131
40	25319.5		26172.34		103368.23	
41	25347.66		26203.42		103376.11	
42	25375.79		26234.51		103383.99	
43	25403.9		26265.60		103391.88	
44	25432.06		26296.70		103399 79	
45	25460.19		26327.80		103407.70	132
46	25488.32		26358.91		103415.63	
47	25516.45		26390.02	519	103423.56	
48	25544 58		26421.14		103431.51	
49	25572.70		26452.26		103439.46	
50	25600.8		26483.39		103447.43	
51	25628.9		26514.52		103455.40	133
52	25657.05		26545.66		103463.38	
53	25685.17		26576.80		103471.38	
54	25713.28		26607.94		103479.38	
55	25741.39	468	26639.09		103487.40	
56	25769 50		26670.25		103495.42	
57	25797.60		26701.41		103503.45	134
58	25825.70		26732.57		103511.50	
59	25853.81		26763.74	520	103519.55	
60	25881.90		26794.92		103527.62	

75. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	96814.76		386671.31		399392 92	
29	96807.48	121	386207.82	7718	398944.21	7471
28	96800.18		385745.37	7700	398496.54	7454
27	96792.88		385283.96	7683	398049.91	7437
26	96785.56		384823.58	7666	397604.31	7419
25	96778.24	122	384364.23	7649	397159.75	7402
24	96770.92		383905.91	7632	396716.21	7385
23	96763.58		383448.61	7615	396273.69	7368
22	96756.24		382992.33	7598	395832.19	7351
21	96748.88		382537.07	7581	395391.71	7334
20	96741,52		382082.81	7564	394952.24	7317
19	96734.15		381629.57	7547	394513.78	7301
18	96726.77	123	381177.33	7530	394076.33	7284
17	96711.35		380726.09	7514	393639.88	7267
16	96722.99		380275.85	7497	393204.43	7251
15	96704.59		379826.61	7481	392769.97	7234
14	96697.18		379378.35	7464	392336.51	7218
13	96689.76		378931.09	7445	391904.03	7201
12	96682.34		378484.81	7431	391472.54	7185
11	96674.90	124	378039.51	7415	391042.03	7168
10	96667.46		377595.19	7399	390612.50	7152
9	96660.01		377151.85	7382	390183.95	7136
8	96652.55		376709.47	7366	389756.37	7120
7	96645.08		376268.07	7350	389329.76	7103
6	96637.61		375827.63	7334	388904.11	7087
5	96630.12		375388.15	7318	388479.43	7071
4	96622.63		374949.63	7302	388055.70	7055
3	96915.13	125	374512.07	7286	387632.93	7040
2	96607.62		374075.46	7270	387211.12	7024
1	96000.11		373639.80	7254	386790.25	7008
0	96592.58		373205.08	7239	386370.33	6992

74. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	96592.58		373205.08		386370.33	
59	96585.05	125	372771.31	7227	385951.35	6976
58	96577 51		372338.47	7207	385533.32	6961
57	96569.96		371906.58	7192	385116.22	6945
56	96562.40	126	371475.61	7176	384700.05	6930
55	96554.84		371045.58	7161	384284.82	6914
54	96547.26		370646.48	7145	383870.51	6899
53	96539.68		370188.29	7130	383457.13	6883
52	96532.09		369761.03	7115	383044.67	6868
51	96524.49		369334.69	7099	382633.13	6853
50	96516.89		368909.27	7084	382222.51	6837
49	96509 27	127	368484.75	7069	381812.80	6822
48	96501.65		368061.15	7054	381403.99	6807
47	96494.02		367638.45	7039	380996.10	6792
46	96486.38		367216.65	7024	380589.11	6777
45	96478.73		366795.75	7009	380183.01	6762
44	96471.08		366375.75	6994	379777.82	6747
43	96463.41		365956.65	6979	379373.52	6732
42	96455.75		365538.43	6964	378970.11	6717
41	96448.06	128	365121.11	6949	378567.60	6702
40	96440.37		364704.67	6935	378165.96	6688
39	96432.68		364289.11	692	377765.22	6673
38	96424.97		363874.44	6906	377365.35	6658
37	96417.26		363460.64	6891	376966.36	6644
36	96409.54		363047.71	6876	376568.24	6629
35	96401.81		362635.65	6862	376171.00	6615
34	96394.07	129	362224.47	6847	375774.62	6600
33	96383.33		361814.15	6833	375379.11	6586
32	96378.58		361404.69	6818	374984.47	6571
31	96370.81		360996 09	6804	374590.68	6557
30	96363.04		360588.35	6790	374197.75	6543

15. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	26723.84		27732.45		103774.22	
31	26751.87	467	27763.78	522	103782.60	139
32	26779.89		27795.12		103790.98	
33	26807.92		27826.45		103799.38	140
34	26835.94		27857.80		103807.79	
35	26863.96		27889.15	523	103816.21	
36	26891.98		27910.50		103824.63	
37	26920.00		27951.86		103833.07	
38	26948.01		27983.22		103841.52	
39	26976.02		28014.59		103849.98	
40	27004.03		28045.97		103858.44	141
41	27032.04		28077.35		103866.92	
42	27060.04		28108.73		103875.41	
43	27088.05		28140.12		103882.91	
44	27116.05		28171.52		103892.42	
45	27144.04		28202.92		103900.94	142
46	27172.04		28234.32		103909.46	
47	27200.03		28265.73	524	103918.00	
48	27228.02		28297.15		103926.55	
49	27256.01	466	28328.57		103935.11	
50	27284.00		28359.99		103943.68	
51	27311.98		28391.42		103952.26	143
52	27339.96		28422.86		103960.85	
53	27367.94		28454.30		103969 45	
54	27395.92		28485.75		103978.06	
55	27413.90		28517.20		103986.68	
56	27451.87		28548.66		103995.32	144
57	27479.84		28580.12		104004.96	
58	27507.81		28611.59		104012.61	
59	27535.77		28643.07	525	104021.27	
60	27563.74		28674.54		104029.94	

74. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	96363.04		360588.35		374197.75	
29	96355.27	129	360181.46	6775	373805.68	6529
28	96347.48		359775.43	6761	373414.46	6514
27	96339.69	130	359370.24	6747	373024.09	6500
26	96331.88		358965.90	6733	372634.57	6486
25	96324.07		358562.41	6719	372245.89	6472
24	96316.25		358159.75	6705	371858.05	6455
23	96308.43		357757.94	6691	371471.05	6444
22	96300.59		357356.95	6677	371084.89	6430
21	96292.75		356956.81	6663	370699.56	6416
20	96284.90		356557.49	6650	340315.06	6403
19	96277.04	131	356159.00	6636	369931.39	6389
18	96269.17		355761.33	6622	369548.54	6375
17	96261.30		355364.45	6618	369166.52	6361
16	96253.41		354968.46	6595	368785.31	6348
15	96245.52		354573.25	6581	368404.93	6334
14	96237.62		354178.86	6568	368025.36	6321
13	96229.72		353785.28	6554	367646.60	6307
12	96221.80	132	353392.52	6541	367268.65	6293
11	96213.87		353000.54	6529	366891.52	6288
10	96205.94		352609.38	6514	366515.18	6267
9	96198.00		352219.02	6500	366139.64	6243
8	96190.05		351829.46	6487	365764.91	6240
7	96182.10		351440.70	6474	365390.97	6227
6	96174.13		351052.73	6461	365017.81	6214
5	96166.16		350665.55	6447	364645.48	6200
4	96158.18	133	350279.16	6434	364273.92	6187
3	96150.19		349893.56	6421	363903.15	6174
2	96142.19		349508.74	6408	363533.16	6161
1	96134.18		349124.70	6395	363163.95	6148
0	96126.17		348741.44	6382	362795.53	6135

16. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
0	27563.74		28674.54		104029.94	
1	27591.70	466	28706.02	525	104038.63	144
2	27619.65		28737.51		104047.32	145
3	27647.61		28769.00		104056.02	
4	27675.56		28800.50		104064.73	
5	27703.52		28832.01		104073.46	
6	27731.46		28863.52		104082.19	
7	27759.41		28895.03		104090.94	
8	27787.36		28926.55		104099.69	146
9	27815.30		28958.08		104108.45	
10	27843.24		28989.61	526	104117.23	
11	27871.18		29021.14		104126.01	
12	27899.11		29052.69		104134.81	
13	27927.04		29084.23		104143.61	
14	27954.97	465	29115.78		104152.43	147
15	27982.90		29147.34		104161.26	
16	28010.83		29178.90		104170.09	
17	28038.75		29210.47		104178.94	
18	28066.67		29242.05		104187.80	
19	28094.59		29273.62		104196.67	
20	28122.50		29305.21		104205.54	148
21	28150.42		29336.80	527	104214.43	
22	28178.33		29368.39		104223.33	
23	28206.24		29399.99		104232.24	
24	28234.15		29431.60		104241.16	
25	28262.05		29463.21		104250.09	
26	28289.95		29494.83		104259.03	149
27	28317.85		29526.45		104267.98	
28	28345.75		29558.08		104276.94	
29	28373.64		29589.71		104285.91	
30	28401.53		29621.35		104294.89	

73. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	96126.17		348741.44		362795.53	
59	96118.15	133	348358.96	6369	362427.88	6122
58	96110.12		347977.26	6356	362061.00	6109
57	96102.08	134	347596.32	6344	361694.90	6096
56	96094.03		347216.16	6331	361329.57	6084
55	96085.58		346836.76	6318	360965.01	6071
54	96077.91		346458.13	6315	360601.21	6058
53	96069.84		346080.26	6293	360238.18	6045
52	96061.77		345703.15	6280	359875.90	6033
51	96053.68		345326.79	6267	359514.39	6020
50	96045.58	135	344951.20	6255	359153.63	6007
49	96037 48		344576.35	6242	358793.62	5995
48	96029.37		344202.26	6230	358434.36	5982
47	96021.25		343828.91	6217	358075.86	5970
46	96013.12		343456.31	6205	357718.10	5957
45	96004.98		343084.46	6192	357361.08	5945
44	95996.84		342713.34	6180	357004.81	5933
43	95988.69		342342.97	6168	356649.28	5920
42	95980.52	136	341973.33	6156	356294.48	5908
41	95972.36		341604.43	6143	355940.42	5896
40	95964.18		341236.26	6131	355587.10	5884
39	95956.00		340868.82	6119	355234.50	5872
38	95947.81		340502.10	6107	354882.63	5859
37	95939.61		340136.12	6095	354531.49	5847
36	95931.40		339770.85	6089	354181.07	5835
35	95923.18	137	339406.31	6071	353831.38	5823
34	95914.95		339042.49	6059	353482.40	5811
33	95906.72		338679.38	6047	353134.14	5799
32	95898.48		338316.99	6035	352786.60	5787
31	95890.23		337955.31	6023	352439.77	5776
30	95881.97		337594.34	6011	352093.65	5764

16. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	28401.53		29621.35		104294.89	
31	28429.42	465	29652.99	527	104303.88	150
32	28457.31		29684.64	528	104312.88	
33	28485.20		29716.30		104321.90	
34	28513.08		29747.96		104330.92	
35	28540.96		29779.62		104339.95	
36	28568.84		29811.29		104348.99	
37	28596.71		29842.97		104358.05	151
38	28624.58		29874.65		104367.12	
39	28652.45	464	29906.34		104376.19	
40	28680.32		29938.03		104385.28	
41	28708.19		29969.73		104394.37	
42	28736.05		30001.44		104403.48	
43	28763.91		30033.15	529	104412.59	152
44	28791.77		30064.86		104421.72	
45	28819.63		30096.58		104430.86	
46	28847.48		30128.31		104440.01	
47	28875.33		30160.04		104449.16	
48	28903.18		30191.78		104458.33	
49	28931.03		30223.52		104467.51	153
50	28958.87		30255.27		104476.70	
51	28986.71		30287.03		104485.90	
52	29014.55		30318.79		104495.11	
53	29042.38		30350.55		104504.33	
54	29070.22		30382.32	530	104513.57	154
55	29098.05		30414.10		104522.81	
56	29125.88		30445.88		104532.06	
57	29153.71		30477.67		104541.32	
58	29181.53		30509.46		104550.60	
59	29209.35		30541.26		104559.88	
60	29237.17		30573.07		104569.18	155

73. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	95881 97		337594.34		352093.65	
29	95873.71	137	337234.08	5999	351748.24	5752
28	95865.43	138	336874.53	5988	351403.54	5740
27	95857 15		336515.68	5976	351059.54	5728
26	95848.86		336157.53	5964	350716.25	5717
25	95840.56		335800.08	5953	350373.65	5705
24	95832.26		335443.33	5941	350031.75	5693
23	95823.94		335087.27	5929	349690.55	5682
22	95815.62		334731.91	5918	349350.04	5670
21	95807.29		334377.24	5906	349010.23	5659
20	95798.95	139	334023.26	5895	348671.10	5647
19	95790.60		333669.97	5883	348332.67	5636
18	95782.25		333317.36	5872	347994.92	5624
17	95773.89		332965.43	5861	347657.85	5603
16	95765.51		332614.19	5849	347321.46	5602
15	95757.14		332263.62	5838	346985.76	5590
14	95748.71		331913 73	6827	346650.73	5579
13	95740.35	140	331564.52	5816	346316.37	5565
12	95731.95		331215.98	5804	345982.69	5557
11	95723.54		330868.11	5793	345649.69	5545
10	95715.12		330520.91	5782	345317.35	5534
9	95706.69		330174.37	5771	344985.68	5523
8	95698.25		329828.51	5760	344654.67	5512
7	95689.81		329483.30	5749	344324.33	5501
6	95681.36		329138.76	5738	343994.65	5490
5	95672.90	141	328794.87	5727	343665.63	5479
4	95664.43		328451.64	5716	343337.27	5468
3	95655.95		328109.07	5705	343004.56	5457
2	95647.47		327767.15	5694	342682.51	5446
1	95638.98		327425.88	5683	342356.11	5435
0	95630.48		327085.26	5672	342030.36	5425

17. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	29237.17		30573.07		104569.18	
1	29264.99	464	30604.88	530	104578.48	155
2	29292.80		30636.69		104587.80	
3	29320.61	463	30668 52		104597.12	
4	29348.42		30700.34	531	104606.46	
5	29376.23		30732.18		104615.80	
6	29404.03		30764.02		104625.16	156
7	29431.83		30795.86		104634.53	
8	29459.63		30827.71		104643.91	
9	29487.43		30859.57		104653.30	
10	29515.22		30891.43		104662.70	
11	29543.02		30923.30		104672.11	157
12	29570.80		30955.17		104681.53	
13	29598.59		30987.05		104690.96	
14	29626.38		31018.93		104700.40	
15	29654.16		31050.82	532	104709.85	
16	29681.94		31082.72		104719.32	
17	29709.71		31114.62		104728.79	158
18	29737.49		31146.53		104738.28	
19	29765.26		31178.44		104747.77	
20	29793.03		31210.36		104757.28	
21	29820.79		31242.29		104766.79	
22	29848.56		31274.22		104776.32	
23	29876.32		31306.16		104785.85	159
24	29904.08		31338.10		104795.40	
25	29931.84		31370.05	533	104804.96	
26	29959.59		31402.00		104814.53	
27	29987.34	462	31433.96		104824.11	
28	30015.09		31465.93		104833.70	
29	30042.84		31497.90		104843.30	160
30	30070.58		31529.88		104852.91	

72. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	95630.48		327085.26		342030.36	
59	95621.97	141	326745.29	5662	341705.26	5414
58	95613.45	142	326405.96	5651	341380.80	5403
57	95604.92		326067.28	5640	341056.99	5392
56	95596.39		325729.24	5630	340733.82	5382
55	95587.85		325391.84	5619	340411.30	5371
54	95579.30		325055.08	5608	340089.41	5360
53	95576.75		324718.95	5598	339768.15	5350
52	95562.18		324383.46	5587	339447.54	5339
51	95553.60		324048.60	5576	339127.55	5329
50	95545.02	143	323714.38	5566	338808.20	5318
49	95536.43		323380.78	5556	338489.48	5308
48	95527.84		323047.80	5545	338171.38	5297
47	95519.23		322715.46	5535	337853.91	5286
46	95510.62		322383.73	5524	337537.07	5276
45	95501.99		322052.63	5514	337220.84	5266
44	95493.36		321722.15	5514	336905.24	5256
43	95484.7[illegible]	144	321392.28	5493	336590.26	5245
42	95476.08		321063.04	5483	336275.89	5235
41	95467.43		320734.40	5473	335962.14	5225
40	95458.76		320406.38	5463	335649.00	5215
39	95450.09		320078.97	5453	335336.47	5205
38	95441.41		319752.17	5442	335024.55	5194
37	95432.73		319425.98	5432	334713.24	5184
36	95424.03	145	319100.39	5422	334402.54	5174
35	95415 33		318775.40	5412	334092.44	5164
34	95406 62		318451.02	5402	333782.94	5154
33	95397 90		318127.24	5392	333474.05	5144
32	95389.17		317804.06	5382	333156.75	5134
31	95380.44		317481.47	5372	332858.05	5124
30	95371.69		317159.48	5362	332550.95	5114

17. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	30070.58		31529.88		104852.91	
31	30098.32	462	31561.86	533	104862.54	160
32	30126.06		31593.85		104872.17	
33	30153.80		31625.85		104881.81	
34	30181.53		31657.85		104891.46	161
35	30209.26		31689.85		104901.13	
36	30236.99		31721.87	534	104910.80	
37	30264.71		31753.89		104920 49	
38	30292.44		31785.91		104930.19	
39	30320.16		31817.94		104939.89	
40	30347.88		31849.98		104949.61	
41	30375.59		31882.02		104959 34	162
42	30403.31		31914.07		104969.08	
43	30431.02		31946.12		104978.83	
44	30458.72		31978.19		104988 59	
45	30486.43		32010.25		104998.36	163
46	30514.13		32042.32	535	105008.14	
47	30541.83		32074.40		105017.94	
48	30569.53		32106.49		105027.74	
49	30597.22		32138.58		105037.56	
50	30624.92		32170.67		105047.38	
51	30652.61	461	32202.78		105057.22	164
52	30680.29		32234.88		105067.06	
53	30707.98		32269.99		105076.92	
54	30735 66		32299.12		105086.79	
55	30763.34		32331.25		105096.67	
56	30791.02		32363.38	536	105106.56	
57	30818.69		32395.52		105116.37	165
58	30846.36		32427.66		105126.79	
59	30874.03		32459 81		105146.27	
60	30901.70		32491.97		105146.22	

72. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	95371.69		317159.48		332550.95	
29	95362.95	145	316838.08	5352	332244.44	5104
28	95354.18	146	316517.28	5343	331938.53	5094
27	95345.42		316197.06	5333	331633.20	5085
26	95336.64		315877.44	5323	331328.47	5075
25	95327.86		315558.40	5313	331024.32	5065
24	95319.07		315239.94	5304	330720 76	5055
23	95310.27		314922.07	5294	330417.78	5046
22	95301.46		314604.78	5284	330115.39	5036
21	95292.64	147	314288.07	5274	329813.57	5026
20	95283.82		313971.94	5265	329512.34	5017
19	95274.99		313656 39	5255	329211.68	5007
18	95266.15		313341.41	5246	328911.60	5997
17	95257.30		313027.01	5236	328612.09	5988
16	95248.44		312713.17	5227	328313.16	5978
15	95239.58		312399.91	5217	328014.79	5969
14	95230.71		312087.22	5218	327717.00	4959
13	95221.83	148	311775.09	5198	327419.77	4950
12	95212.94		311463.53	5189	327123.11	4940
11	95204,04		311152.53	5179	326827.02	4931
10	95195.14		310842.10	5170	326531.49	4922
9	95186.23		310532.23	5161	326236.52	4912
8	95177.31		310222.91	5151	325942.11	4903
7	95168.38		309914.16	5142	325648.25	4894
6	95159.44	149	309605.96	5133	325354 96	4884
5	95150.50		309298.31	5124	325062.22	4875
4	95141.54		308991.22	5114	324770.03	4866
3	95132.58		308684.68	5105	324478.40	4857
2	95123.61		308378 69	5096	324187.32	4848
1	95114.64		308073.25	5087	323896 78	4838
0	95105.65		307768.35	5078	323606.80	4829

18. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
0	30901.70		32491.97		105146.22	
1	30929.36	461	32524.13	536	105156.17	165
2	30957.02		32556.30		105199.12	166
3	30984.68		32588.48		105176.08	
4	31012 34		32620.66		105186.06	
5	31039.99		32652.84	537	105196.05	
6	31067.64		32685.04		105206.04	
7	31095.29		32717.24		105216.05	167
8	31122.94		32749.44		105226.07	
9	31150.58		32781.65		105236.10	
10	31178.22		32813.87		105246.14	
11	31205.86		32846.10		105265.19	
12	31233.49		32878.33		105266.25	
13	31261.12		32910.56		105276.33	168
14	31288 75	460	32942.81		105286.41	
15	31316.38		32975.05	538	105296.51	
16	31344.00		33007.31		105306.61	
17	31371.63		33039.57		105316.73	
18	31399.25		33071.84		105326.85	
19	31426.86		33104.11		105336.99	169
20	31454.84		33136.39		105347.14	
21	31482.09		33168.68		105357.30	
22	31509.69		33200.97		105367.47	
23	31537.30		33233.27		105377.65	
24	31564.90		33265.57		105387.85	
25	31592 50		33297.88	539	105398.05	170
26	31620.10		33330.20		105408.26	
27	31647.70		33362.52		105418.49	
28	31675.29		33394.85		105428.73	
29	31702.88		33427.19		105438 97	
30	31730.47		33459.53		105449.23	171

71. Grad.

′	Sinus	10″	Tangens.	10″	Secans.	10″
60	95105.65		307768.35		323606.80	
59	95096.66	149	307464.00	5069	323317.36	4820
58	95087.66	150	307160.20	5060	323028.46	4811
57	95078.65		306856.93	5051	322740.11	4802
56	95069.63		306554.21	5042	322452.30	4793
55	95060.61		306252.03	503	322165.03	4784
54	95051.57		305950.38	5024	321878.30	4775
53	95042.53		305649.28	5015	321592.10	4766
52	95033.48		305348.70	5006	321306.44	4757
51	95024.42	151	305048.66	4997	321021.32	4749
50	95015.36		364749.15	4988	320736.72	4740
49	95006.29		304450.18	4979	320452.66	4731
48	94997.20		304151.73	4970	320169.13	4722
47	94988.12		303853.81	4962	319886.13	4713
46	94979.02		303556.41	4953	319603.65	4704
45	94969.91		303259.54	4944	319321.70	4696
44	94960.80		302963.20	4935	319040.28	4697
43	94951.68	152	302667.37	4927	318759.37	4678
42	94942.55		302372.07	4918	318478.99	4669
41	94933.41		302077.28	4909	318199.13	4661
40	94924.26		301783.01	4901	317919.78	4652
39	94915.11		301489.26	4892	317640.95	4644
38	94905.95		301196.02	4884	317362.64	4635
37	94896 78		300903.30	4875	317084.81	4626
36	94887.60	153	300611.09	4867	316807.56	4618
35	94878.41		300319.39	4858	316530.78	4609
34	94869.22		300028.20	4850	316254.52	4601
33	94860.02		299737.51	4841	315978.76	4592
32	94850.81		299447.34	4833	315703.51	4584
31	94841.59		299157.66	4824	315428.77	4576
30	94832.37		298868.50	4816	315154.53	4567

18. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	31730.47		33459.53		105449.23	
31	31758 05	460	33491.88	539	105459.50	171
32	31785.63		33524.23		105469.78	
33	31813.21		33556.60		105480.07	
34	31840.79		33588.96		105490.37	
35	31868 36		33621.34	540	105500 68	172
36	31895.93	459	33653.72		105511.01	
37	31923.50		33686 10		105521.34	
38	31951.06		33718.50		105531.69	
39	31978.63		33750.90		105542.04	
40	32006.19		33783.30		105552.41	
41	32033.74		33815.71		105562.79	173
42	32061.30		33848.13		105573.18	
43	32088.85		33880.56		105583.58	
44	32116.40		33912.99	541	105593.99	
45	32141.95		33945.43		105604.41	
46	32171.49		33977.87		105614.85	174
47	32199.03		34010.32		105625.29	
48	32226.57		34042.78		105635.74	
49	32254.10		34075.24		105646.21	
50	32281.64		34107.71		105656.69	
51	32309 17		34140.19		105667.18	
52	32336.69		34172.67		105677.68	175
53	32364.22		34205.16		105688.19	
54	32391.74		34237 65	542	105698.71	
55	32419.26		34270.15		105709.24	
56	32446.78		34302.66		105719.78	
57	32474.29		34335.18		105730.34	176
58	32501.80	458	34367.70		105740.90	
59	32529.31		34400.23		105751.48	
60	32556.81		34432.76		105762.07	

71. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	94832.37		298868.50		315154.53	
29	94823.13	154	298579.83	4808	314880.79	4559
28	94813.89		298291.66	4799	314607.56	4550
27	94804.64		298004.00	4791	314334.83	4542
26	94795.38		297716.83	4783	314062.59	4534
25	94786.11		297430.16	4774	313790.86	4525
24	94776.84		297143.99	4766	313519.61	4517
23	94767.56		296858.31	4758	313248.87	4509
22	94758.27		296573.12	4750	312978.62	4500
21	94748.97	155	296288.42	4742	312708.86	4493
20	94739.66		296004.22	4733	312439.59	4484
19	94730.35		295720.50	4725	312170.81	4476
18	94721.03		295437.27	4717	311902.52	4468
17	94711.70		295154.53	4709	311632.72	4460
16	94702.36		294872.27	4701	311367.40	4452
15	94693.01		294590.50	4693	311100.57	4444
14	94683.66	156	294309.21	4685	310834.22	4439
13	94674.30		294028.40	4677	310568 35	4428
12	94664.93		293748.07	4669	310303.96	4420
11	94655.55		293468.22	4661	310028.05	4411
10	94646.16		293188.84	4653	309773.62	4404
9	94636.77		292909.95	4645	309509.67	4396
8	94627.36		292631.52	4637	309246.19	4388
7	94617.95		292353.58	4629	308983.19	4380
6	94608.54	157	292076.10	4621	308720.66	4372
5	94590 11		291799.09	4613	308458.60	4364
4	94589.67		291522.56	4606	308197.02	4357
3	94580.23		291246.49	4598	307935.90	4349
2	94570.78		290970.89	4590	307675.25	4341
1	94561.32		290695.76	4582	307415.07	4333
0	94551.86		290421.09	4575	307155.35	4325

19. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	32556.81		34432.76		105762.07	
1	32584.32	458	34465.30	542	105773.27	176
2	32611.82		34497.85		105783.28	
3	32639.31		34530.40	543	105793.90	177
4	32666.81		34562.96		105804.53	
5	32694.30		34595.53		105815.17	
6	32721.79		34628.10		105825.83	
7	32749.28		35660.68		105836.49	
8	32776.76		34693.27		105847.17	178
9	32804.24		34725.86		105857.86	
10	32831.72		34758.46		105868.55	
11	32859.19		34791.07		105879.26	
12	32886.66		34823.68	544	105889.98	
13	32914.13		34856.30		105900.72	179
14	32941.60		34888.93		105911.46	
15	32969.06		34921.56		105922.21	
16	32996.53		34954.20		105932.98	
17	33023.98		34986.85		105943.76	
18	33051.44		35019.50		105954.54	
19	33078.89		35052.16		105965.34	180
20	33106.34	457	35084.83		105976.15	
21	33133.79		35117.50	545	105986.97	
22	33161.23		35150.18		105997.81	
23	33188.67		35182.87		106008.65	
24	33216.11		35215.56		106019.51	181
25	33243.55		35248.26		106030.37	
26	33270.98		35280.96		106041.25	
27	33298.41		35313.68		106052.14	
28	33325.84		35356.40		106063.04	
29	33353.26		35379.12		106073.95	182
30	33380.69		35411.86		106084.87	

70. Grad.

′	Sinus	10″	Tangens	10″	Secans	10″
60	94551.86		290421.09		307155.35	
59	94542.38	158	290146.88	4567	306896.10	4318
58	94532.90		289873.14	4559	306637.31	4301
57	94523.41		289599.86	4551	306378.98	4302
56	94513.91		289327.04	4544	306121.11	4295
55	94504.41		289054.67	4536	305863.70	4287
54	94494.89		288782.77	4529	305606.75	4279
53	94485.37		288511.32	4521	305350.26	4272
52	94475.84		288240.33	4513	305094.23	4264
51	94466.30	159	287969.79	4506	304838.64	4257
50	94456.75		287699.70	4498	304583.52	4249
49	94447.20		287430.07	4491	304328.84	4241
48	94437.64		287160.88	4483	304074.62	4233
47	94428.07		286892.15	4476	303820.84	4226
46	94418.49		286623.86	4468	303567.52	4219
45	94408.90		286356.02	4461	303314.64	4211
44	94399 31	160	286088.63	4453	303062.21	4204
43	94389.70		285821.68	4446	302810.23	4197
42	94380.09		285555.17	4439	302558.68	4189
41	94370.48		285289.11	4431	302307.59	4182
40	94360.85		285023.49	4424	302056.93	4175
39	94351.22		284758.31	4417	301806.71	4167
38	94341.57		284493.56	4409	301556.94	4160
37	94331.92		284229.26	4402	301307.60	4153
36	94322.27	161	283965.39	4495	301058.70	4145
35	94312.60		283701.96	4388	300810.24	4138
34	94302.92		283438.96	4380	300562.21	4131
33	94293.24		283176.39	4373	300314.62	4124
32	94283.55		282914.26	4366	300067.46	4116
31	94273.85		282652.56	4359	299820.71	4110
30	94264.15		282391.29	4352	299574.43	4102

19. Grad.

	Sinus	10″	Tangens	10″	Secans	10′
30	33380.69		35411.86		106084.87	
31	33408.10	457	35444.60	546	106095.80	182
32	33435.52		35477.34		106106.75	
33	33462.93		35510.10		106117.70	
34	33490.34		35542.86		106128.67	
35	33517.75		35575.62		106139.65	183
36	33545.16		35608.40		106150.64	
37	33572.56		35641.18		106167.64	
38	33599.96		35673.97		106172.65	
39	33627.35		35706.76	547	106183.67	
40	33654.75		35739.56		106194.71	184
41	33682.14	456	35772,37		106205.75	
42	33709.53		35805.18		106216.81	
43	33736.91		35838.00		106227.88	
44	33764.29		35870.83		106238.96	
45	33791.67		35903.67		106250.05	185
46	33819.05		35936.51		106261,15	
47	33846.42		35969.36		106272.27	
48	33873.79		36002.21	548	106283.39	
49	33901.16		36035.08		106294.53	
50	33928.52		36067.95		106305.68	
51	33955.89		36100.82		106316.83	186
52	33983.24		36133.71		106328.01	
53	34010.60		36166.60		106339.19	
54	34037.95		36199.49		106350.38	
55	34065.30		36232.40		106361.58	
56	34092.65		36265.31	549	106372.80	187
57	34120.00		36298.23		106384.03	
58	34147.34		36331.15		106395.27	
59	34174.68		36364.08		106406.52	
60	34202,01		36397.02		106417.78	

70. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	94264.15		282391.29		299574.43	
29	94254.43	162	282130.45	4344	299328.56	4095
28	94244.71		281870.03	4337	299083.12	4088
27	94234.98		281610.04	4330	298838.11	4081
26	94225.24		281350.48	4323	298593.52	4073
25	94215.50		281091.34	4316	298349.36	4066
24	94205.74		280832.63	4309	298105.63	4050
23	94195.98		280574.33	4302	297862.31	4052
22	94186.21		280316.46	4295	297619.42	4045
21	94176.44	163	280059.01	4288	297376.95	4038
20	94166.65		279801.98	4281	297134.90	4031
19	94156.86		279545.37	4274	296893.27	4024
18	94147.05		279287.17	4267	296652.02	4017
17	94137.24		279033.39	4260	296411.25	4010
16	94127.43		278778.02	4253	296170.87	4003
15	94117 60		278523.07	4246	295930.90	3997
14	94107.77		278268.53	4239	295691.35	3990
13	94097.93	164	278014.40	4233	295452.21	3983
12	94088.08		277760.68	4226	295213.48	3976
11	94078.22		277507.38	4219	294975.16	3969
10	94068.35		277254.48	4212	294737.25	3962
9	94058.48		277001.99	4205	294499.75	3956
8	94048.60		276749 90	4199	294262.65	3940
7	94038 7[illegible]		276498.22	4192	294025.96	3942
6	94028.81	165	276246.95	418[illegible]	293789 68	3935
5	94018.91		275996.08	4178	293553.80	3928
4	94008.99		275745.61	4172	293318.33	3923
3	93990.07		275495.54	4165	293083.26	3915
2	93989.14		275245.83	4158	292848.58	3908
1	93979.2[illegible]		274996 61	4152	2926[illegible]4.31	3903
0	93969.26		274747.74	4145	292380.44	3895

20. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	34202.01		36397.02		106417.78	
1	34229.35	456	36429.97	549	106429.05	188
2	34256.68	455	36462.92		106440.33	
3	34284.00		36495.88		106451.63	
4	34311.33		36528.85		106462.94	
5	34338.65		36561.82	550	106474.25	
6	34365.97		36594.80		106485.58	
7	34393.28		36627.79		106496.92	189
8	34420.60		36660.79		106508.28	
9	34447.91		36693.79		106519.64	
10	34475.21		36726.80		106531.02	
11	34502.52		36759.81		106542.40	
12	34529.82		36792.84		106553.80	190
13	34557.12		36825.87	551	106565.21	
14	34584.41		36858.90		106576.63	
15	34611.71		36891.95		106588.07	
16	34638.99		36925.00		106599.51	
17	34666.28		36958.06		106610.97	191
18	34693.56		36991.12		106622.43	
19	34720.85		37024.20		106633.91	
20	34748.12		37057.28		106645.40	
21	34775.40		37090.36		106656.90	
22	34802.67	454	37123.46	552	106668.42	192
23	34829.94		37156.56		106679.94	
24	34857.20		37189.67		106691.48	
25	34884.47		37222.78		106703.02	
26	34911.73		37255.90		106714.58	
27	34938 98		37289.03		106726.15	193
28	34966.24		37322.17		106737.74	
29	34993.49		37355.32		106749.33	
30	35020.74		37388.47	553	106760.94	

69. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	93969.26		274747.74		292380.44	
59	93959.31	165	274499.27	4138	292146.97	3888
58	93949.35	166	274251.20	4132	291913.89	3882
57	93939.38		274003.52	4125	291681.21	3875
56	93929.42		273756.23	4119	291448.91	3869
55	93919.42		273509.34	4112	291217.03	3862
54	93909.42		275262.84	4106	290985.53	3856
53	93899.42		273016.74	4099	290754.43	3849
52	93889.42		272771.02	4093	290523.72	3843
51	93879.40	167	272525.69	4086	290293.39	3836
50	93869.37		272280.75	4080	290063.46	3830
49	93859.34		272036.20	4073	289833.91	3823
48	93849.30		271792.04	4067	289604.75	3817
47	93839.25		271548.26	4060	289375.98	3810
46	93829.20		271304.87	4054	289147.60	3804
45	93819.13		271061.86	4047	288919.59	3797
44	93809.06		270819.23	4041	288691.98	3791
43	93798.98	168	270576.99	4035	288464.74	3785
42	93788.89		270345.13	4028	288237.89	3778
41	93778.80		270093.64	4022	288011.42	3772
40	93768.69		269852.54	4016	287785.32	3766
39	93758.58		269611.81	4009	287559.61	3759
38	93748.46		269371.47	4003	287334.28	3753
37	93738.33		269131.49	3997	287109.32	3747
36	93728.20	169	268891.90	3991	286884.74	3740
35	93718.05		268652.67	3984	286660.53	3734
34	93707.90		268413.83	3978	286436.70	3728
33	93697.74		268175.35	3972	286213.24	3722
32	93687.58		267937.25	3966	285990.15	3716
31	93677.40		267699.51	396[illegible]	285767.44	3709
30	93667.22		267462.15	3960	285545.09	3703

20. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	35020.74		37388.47		106760.94	
31	35047.98	454	37421.63	553	106772.55	193
32	35075.23		37454.79		106784.18	
33	35102.46		37487.97		106795.82	194
34	35129.70		37521.15		106807.47	
35	35156.93		37554.33		106819.14	
36	35184.16		37587.53		106830.81	
37	35211.39		37620.73		106842.50	
38	35238.62		37653.94	554	106854.20	195
39	35265.84		37687.16		106865.91	
40	35293.06		37720.38		106877.63	
41	35320.27		37753.61		106889.36	
42	35347.48		37786.85		106901.10	
43	35374.69	453	37820.10		106912.86	196
44	35401.90		37853.35		106924.63	
45	35429.10		37886.61		106936.41	
46	35456.30		37919.88		106948,20	
47	35483.50		37953.15	555	106960.00	
48	35510.70		37986.44		106971.82	197
49	35537.89		38019.73		106983.64	
50	35565.08		38053.02		106995 48	
51	35592.26		38086.33		107007.33	
52	35619.44		38119.64		107019.19	
53	35646.62		38152.96		107031.06	198
54	35673.80		38186.29		107042.95	
55	35700.97		38219.62	556	107054.84	
56	35728.14		38252.96		107066 75	
57	35755.31		38286.31		107078 67	
58	35782.47		38319.67		107090.60	199
59	35809.64		38353.03		107102.54	
60	35836.79		38386.40		107114.51	

69. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	93667.22		267462.15		285545.09	
29	93657.03	169	267225.15	3947	285323.12	3697
28	93646.83	170	266988.53	3941	285101.52	3691
27	93636.62		266752.27	3935	284880.28	3685
26	93626.41		266516.38	3929	284659.41	3679
25	93616.18		266280.85	3923	284438.91	3673
24	93605.95		266045.69	3917	284218.77	3666
23	93595.71		265810.89	3911	283998.99	3660
22	93585.47		265576.45	3905	283779.58	3654
21	93575.21	171	265342.38	3899	283560.54	3648
20	93564.95		265108.67	3893	283341.85	3642
19	93554.68		264875.31	3887	283123.53	3636
18	93544.48		264642.32	3881	282905.56	3630
17	93534.12		264409.69	3875	282687.96	3624
16	95523.82		264177.41	3869	282470.71	3618
15	93513.52		263945.49	3863	282253.82	3612
14	93503.21		263713.92	3857	287032.29	3606
13	93492.89	172	263482.71	3851	281821.11	3600
12	93482.57		263251.86	3845	281605.29	3595
11	93472.23		263021.30	3839	281389.82	3589
10	93461.89		262791.21	3833	281174.71	3583
9	93451.54		262561.41	3828	280959.95	3577
8	93441.19		262331 96	3822	280745.54	3571
7	93430.82		262102.86	3816	280531.48	3565
6	93420.45		261874.11	3810	280317.77	3559
5	93410.07	173	261645.71	3804	280104.41	3554
4	93399.68		261417.66	3798	279891.40	3548
3	93389.28		261189.95	3793	279678.73	3542
2	93378.88		260962.59	3787	279466.41	3536
1	93368.46		260735.58	3781	279254.44	3530
0	93358.04		260508.91	3755	279042.81	3525

21. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	35836.79		38386.40		107114.51	
1	35863.95	453	38419.78		107126.47	
2	35891.10	452	38453.17	556	107138.44	199
3	35918.25		38486.56	557	107150.43	
4	35945.40		38519.96		107162.44	
5	35972.54		38553.37		107174.45	200
6	35999.68		38586.79		107186.47	
7	36026.82		38620.21		107198.51	
8	36053.95		38653.64		107210.56	
9	36081.08		38687.08		107222.62	201
10	36108.21		38720.53		107234.69	
11	36135.33		38753.98	558	107246.78	
12	36162.46		38787.44		107258.87	
13	36189.58		38820.91		107270.98	
14	36217.69		38854.39		107283.10	202
15	36243.80		38887.87		107295.23	
16	36270.91		38921.36		107307.37	
17	36298.02		38954.86		107319.53	
18	36325.12		38988.37		107331.70	
19	36352.22		39021.88	559	107343.87	
20	36379.32		39055.41		107356.07	203
21	36406.41		39088.94		107368.27	
22	36433.51	451	39122.47		107380.48	
23	36460.59		39156.02		107392.71	
24	36487.68		39189.57		107404.95	204
25	36514.76		39223.13		107417.20	
26	36541.84		39256.70		107429.46	
27	36568.91		39290.27		107441.74	
28	36595.99		39323.86		107454.02	
29	36623.06		39357.45	560	107466.31	205
30	36650.12		39391.05		107478.62	

68. Grad.

	Sinus.	10″	*Tangens.*	10″	*Secans.*	10″
60	93358.04		260508.91		279042.81	
59	93347.61	173	260282.58	3770	278831.53	3519
58	93337.18	174	260056.59	3764	278620.59	3513
57	93326.73		259830.95	3758	278409.99	3508
56	93316.28		259605.64	3753	278199.73	3502
55	93305.82		259380.68	3747	277989.82	3496
54	93295.35		259156.06	3741	277780.24	3491
53	93284.88		258931.77	3736	277571.00	3485
52	93274.39		258707.82	3730	277362.11	3479
51	93263.90		258484.21	3725	277153.55	3474
50	93253.40	175	258266.04	3719	276945.32	3468
49	93242.89		258038.00	3713	276737.43	3462
48	93232.38		257815.39	3708	276529.88	3457
47	93221.86		257593.12	3702	276322.66	3451
46	93211.33		257371.18	3697	276115.78	3446
45	93200.79		257149.57	3691	275909.23	3440
44	93190.24		256928.30	3686	275703.01	3435
43	93179.68	176	256707.35	3680	275497.12	3439
42	93169.12		256486.74	3675	275291.57	3424
41	93158.55		256266.45	3669	275086.34	3418
40	93147.97		256046.49	3664	274881.44	3413
39	93137.39		255826.86	3658	274676.87	3407
38	93126.79		255607.56	3653	274472.63	3402
37	93116.19		255388.58	3647	274268.71	3396
36	93105.58		255169.92	3642	274065.12	3391
35	93094.96	177	254951.60	3637	273861.86	3385
34	93084.34		254733.59	3631	273658.92	3380
33	93073.70		254515.91	3626	273456.30	3375
32	93063.06		254298.55	3620	273254.00	3369
31	93052.41		254081.51	3615	273052.03	3364
30	93041.76		253864.79	3601	272850.38	3354

21. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	36650.12		39391.05		107478.62	
31	36677.19	451	39424.65	560	107490.94	205
32	36704.25		39458.27		107503.28	
33	36731.30		39491.89		107515.62	
34	36758.36		39525.52	561	107527.98	206
35	36785.41		39559.16		107540.35	
36	36812.45		39592.80		107552.73	
37	36839 50		39626.45		107565.12	
38	36866.54		39660.11		107577.53	
39	36893.58		39693.78		107589 94	207
40	36920.61		39727.46		107602.37	
41	36947.65	450	39761.14		107614.81	
42	36974.68		39794.83	562	107627.27	
43	37001.70		39828.53		107639.73	
44	37028.72		39862.24		107652.21	208
45	37055.74		39895.95		107664.70	
46	37082.76		39929.68		107677.20	
47	37109.77		39963.41		107689.71	
48	37136.78		39997.15		107702.24	
49	37163.79		40030.89		107714.77	209
50	37190.79		40064.65	563	107727.32	
51	37217.79		40098.41		107739.88	
52	37244.79		40132.18		107752.46	
53	37271.79		40165.96		107765.04	
54	37298 78		40199.74		107777.64	210
55	37325.77		40233.54		107790.25	
56	37352.75		40267.34		107802.87	
57	37379.73		40301.15	564	107815.50	
58	37406.71		40334.96		107828.15	
59	37433.69		40368.79		107840.84	211
60	37460.66		40402.62		107853.47	

68. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
30	93041.76		253864.79		272850.38	
29	93031.09	177	253648.39	3604	272649.05	3353
28	93024.19		253432.31	3599	272448.04	3348
27	93009.74	178	253216.55	3594	272247.35	3343
26	92999.05		253001.11	3589	272046.95	3337
25	92988.35		252785.98	3583	271846.93	3332
24	92977.65		252571.17	3578	271647.19	3327
23	92966.94		252356.67	3573	271447.77	3321
22	92956.22		252142.49	3567	271248.66	3316
21	92945.49		251928.63	3562	271049.87	3311
20	92934.75	179	251715.07	3557	270851.39	3306
19	92924.01		251501.83	3552	270653.23	3301
18	92913.26		251288.90	3547	270455.38	3295
17	92902.50		251076.28	3541	270257.84	3290
16	92891.73		250863.98	3536	270060.61	3285
15	92880.95		250651.98	3531	269863.70	3280
14	92870.17		250440.29	3526	269667.09	3275
13	92859.38		250228.91	3520	269470.79	3270
12	92848.58	180	250017.84	3516	269274.80	3264
11	92837.78		249807.07	3511	269579.12	3259
10	92826.96		249596.61	3506	268883.74	3254
9	92816.14		249386.45	3500	268688.67	3249
8	92805.31		249176.60	3495	268493.91	3244
7	92794.47		248967.06	3490	268299.45	3239
6	92783.62		248757.81	3485	268105.30	3234
5	92772.77		248548.87	3480	267911.44	3229
4	92761.91	181	248340.23	3475	267717.90	3224
3	92751.04		248131.90	3470	267524.65	3219
2	92740.16		247923.86	3465	267331.70	3214
1	92729.28		247716.12	3460	267139.06	3209
0	92718.38		247508.68	3455	266946.72	3204

22. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
0	37460.66		40402.62		107853.47	
1	37487.63	449	40436.46	564	107866.17	211
2	37514.59		40470.31		107878.85	
3	37541.56		40503.17		107891.56	
4	37568.52		40538.03		107904.27	212
5	37595.47		40571.91	565	107917.00	
6	37622.43		40605.79		107929.75	
7	37649.38		40639.68		107942.50	
8	37676.32		40673.57		107955.27	
9	37703.27		40707.48		107968.05	213
10	37730.21		40741.39		107980.84	
11	37757.14		40775.31		107993.64	
12	37784.08		40809.24	566	108006.45	
13	37811.01		40843.18		108019.28	
14	37837.94		40877.13		108032.12	214
15	37864.86		40911.08		108044.97	
16	37891.78		40945.04		108057.84	
17	37918.70		40979.01		108070.71	
18	37945.62		41012.99		108083.60	
19	37972.53	448	41046.97		108096.50	215
20	37999.44		41080.97	567	108109.42	
21	38026.34		41114.97		108122.34	
22	38053.24		41148.98		108135.28	
23	38080.14		41183.00		108148.23	
24	38107.04		41217.03		108161.19	216
25	38133.93		41251.06		108174.16	
26	38160.82		41285.10		108187.15	
27	38187.70		41319.15	568	108200.15	
28	38214.59		41353.21		108213.16	217
29	38241.47		41387.28		108226.18	
30	38268.34		41421.36		108239.22	

67. Grad.

	Sinus	10''	*Tangens*	10''	*Secans*	10''
60	92718.38		247508.68		266946.72	
59	92707.48	181	247301.55	3450	266754.67	3199
58	92696.58		247094.70	3445	266562.92	3194
57	92685.66	182	246888.16	3440	266371.48	3189
56	92674.73		246681.91	3435	266180.32	3184
55	92668.80		246475.96	3430	265989.47	3179
54	92654.86		246570.30	3426	265798.91	3174
53	92641.91		246064.94	3421	265608.65	3169
52	92630.96		245859.87	3416	265418.68	3164
51	92619.99		245655.09	3411	265229.01	3159
50	92609.02		245450.61	3406	265039.62	3154
49	92598.04	183	245246.42	3401	264850.54	3149
48	92587.06		245042.52	3396	264661.74	3145
47	92576.06		244838.91	3391	264473.23	3140
46	92565.06		244635.59	3387	264285.02	3135
45	92554.05		244432.56	3382	264097.09	3130
44	92543.03		244229.82	3377	263909.46	3125
43	92532.01		244027.36	3372	263722.11	3120
42	92520.97	184	243825.19	3367	263535.05	3116
41	92509.93		243623.31	3363	263348.28	3111
40	92498.88		243421.72	3358	263161.80	3106
39	92487.82		243220.41	3353	262975.60	3101
38	92476.76		243019.38	3348	262789.69	3097
37	92465.68		242818.64	3344	262604.06	3092
36	92454.60		242618.19	3339	262418.72	3087
35	92443.51		242418.01	3334	262233.66	3082
34	92432.42	185	242218.12	3330	262048.88	3078
33	92421.31		24201[illegible]	3325	261864.39	3073
32	92410.20		241819.18	3320	261680.18	3068
31	92399.08		241620.13	3316	261496.24	3064
30	92387.95		241421.36	3311	261312.59	3059

22. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	38268.34		41421.36		108239.22	
31	38295.22	448	41455.44	568	108252.27	217
32	38322.09		41489.53		108265.33	
33	38348.95		41523.63		108278.40	
34	38375.82		41557.74	569	108291.48	218
35	38402.67		41591.86		108304.58	
36	38429.53		41625.98		108317.69	
37	38456.39	447	41660.12		108330.81	
38	38483.24		41694.26		108343.95	219
39	38510.08		41728.41		108357.09	
40	38536.93		41762.56		108370.25	
41	38563.77		41796.73		108383.42	
42	38590.60		41830.91	570	108396.61	
43	38677.44		41865.09		108409.80	220
44	38644.27		41899.28		108423.01	
45	38671.10		41933.48		108436.23	
46	38697.92		41967.69		108449.47	
47	38724.74		42001.90		108462.71	
48	38751.56		42036.13		108475.97	221
49	38778.37		42070.36	571	108489.24	
50	38805.18		42104.60		108502.52	
51	38831.99		42138.85		108515.82	
52	38858.80		42173.11		108529.12	
53	38885.60		42207.38		108542.44	222
54	38912.39		42241.65		108555.78	
55	38939.19		42275.94		108569.12	
56	38965.98	446	42310.23		108582.48	
57	38992.77		4234[illegible]53	572	108595.85	223
58	39019.51		423[illegible]84		108609.23	
59	39046.33		42423.16		108622.63	
60	39073.11		42447.48		108636.04	

67. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	92387.95		241421.36		261312.59	
29	92376.82	185	241222.86	3306	261129.22	3054
28	92365.67		241024.65	3302	261946.13	3050
27	92354.52		240826.72	3297	260763.32	3045
26	92343.36	186	240629.06	3292	260580.78	3040
25	92332.20	.	240431.68	3288	260398.52	3036
24	92321.02		240234.57	3283	260216.54	3031
23	92309.84		240037.74	3279	260034.84	3026
22	92298.95		239841.18	3274	259853.41	3022
21	92287.45		239644.90	3269	259672.25	3017
20	92276.24		239448.89	3265	259491.37	3013
19	92265.03	187	239253.16	3260	259310.77	3008
18	92253.81		239057.69	3256	259130.43	3004
17	92242.58		238862.50	3251	258950.37	2999
16	92231.34		238667.58	3247	258770.58	2995
15	92220.09		238472.93	3242	258591.07	2990
14	92220.97		238278.55	3238	258411.82	2986
13	92197.58		238084.44	3233	258232.84	2981
12	92186.31		237890.60	3229	258054.14	2977
11	92175.04	188	237697.02	3224	257875.70	2972
10	92163.75		237503.72	3220	257697.53	2968
9	92152.46		237310.68	3215	257519.63	2963
8	92141.16		237117.91	3211	257341.99	2959
7	92129.86		236925.40	3207	257164.62	2954
6	92118.54		236733.16	3202	256987.52	2950
5	92107.22		236541.18	3199	256810.69	2945
4	92095.89		236349.46	3193	256634.12	2941
3	92084.55	139	236158.01	3189	256457.37	2937
2	92073.20		235966.83	3185	256281.76	2932
1	92061.85		235775.90	3 80	256105.99	2928
0	92050.48		235584.24	3176	255930.47	2923

66. Grad.

′	Sinus	10″	Tangens	10″	Secans	10″
60	92050.48		235585.24		255930.47	
59	92039.12	189	235394.83	3172	255755.21	2919
58	92027.74		235204.69	3167	255580.22	2915
57	92016.35		235014.81	3163	255405.48	2910
56	92004.96		234825.19	3159	255231.01	2906
55	91993.56	190	234635.82	3154	255056.80	2902
54	91982.15		234446.72	3150	254882.84	2897
53	91970.73		234257.87	3146	254709.15	2893
52	91959.31		234069.28	3141	254535.71	2889
51	91947.88		233880.95	3137	254362.53	2885
50	91936.44		233692.87	3133	254189.61	2880
49	91924.99		233505.05	3129	254016.94	2876
48	91913.53	191	233317.48	3124	253844.53	2872
47	91902.07		233130.17	3120	253672.38	2867
46	91890.60		232943.11	3116	253500.48	2863
45	91879.12		232756.30	3112	253328.83	2859
44	91867.63		232569.75	3107	253157.44	2855
43	91856.14		232383.45	3103	252986.30	2851
42	91844.64		232197.40	3099	252815.41	2846
41	91833.13		232011.60	3095	252644.78	2842
40	91821.61	192	231826.06	3091	252474.40	2838
39	91810.08		231640.76	3087	252304.26	2834
38	91798.55		231455.71	3082	252134.38	2830
37	91787.01		231270.91	3078	251964.75	2825
36	91775 46		231086.36	3074	251795.37	2821
35	91763.91		230902.06	3070	251626.24	2817
34	91752.34		230718.01	3067	251457.35	2813
33	91740.77		230534.20	3062	251288.71	2809
32	91729.19	193	230350.64	3058	251120.32	2805
31	91717.60		230167.32	3054	250952.18	2801
30	91706.01		229984.25	3049	250784.28	2797

23. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	39874.91		43481.24		109044.11	
31	39901.58	445	43515.83	577	109057.91	230
32	39928.25	444	43550.43		109071.72	
33	39954.92		43585.04		109085.54	
34	39981.58		43619.66		109099.38	
35	40008.25		43654.29		109113.23	
36	40034.90		43688.93		109127.09	231
37	40061.56		43723.57		109140.97	
38	40088.21		43758.22	578	109154.85	
39	40114.86		43792.89		109168.75	
40	40141.50		43827.56		109182.67	232
41	40168.14		43862.24		109196.59	
42	40194.78		43896.93		109210.53	
43	40221.41		43931.63		109224.48	
44	40248.04		43966.34		109238.45	
45	40274.67		44001.05	579	109252.42	233
46	40301.29		44035.78		109266.42	
47	40327.91		44070.51		109280.42	
48	40354.53		44105.25		109294.43	
49	40381.14		44140.01		109308.46	
50	40407.75	443	44174.77		109322.50	234
51	40434.36		44209.54	580	109336.56	
52	40460.96		44244.32		109350.63	
53	40487.56		44279.10		109364.71	
54	40514.16		44313.90		109378.80	235
55	40540.75		44348.71		109392.90	
56	40567.34		44383.52		109407.02	
57	40593.93		44418.34		109421.16	
58	40620.51		44453.18	581	109435.30	
59	40647.09		44488.02		109449.46	236
60	40673.66		44522.87		109463.63	

66. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	91706.01		229984.25		250784.28	
29	91694.40	193	229801.43	3045	250616.63	2792
28	91682.79		229618.85	3041	250449.23	2788
27	91671.17		229436.51	3037	250282.07	2785
26	91659.55		229254.42	3033	250115.15	2780
25	91647.91	194	229072.57	3029	249948.47	2776
24	91636 27		228890.96	3025	249782.04	2772
23	91624.62		228790.59	3021	249615.86	2768
22	91612.97		228528.46	3017	249449.91	2764
21	91601.50		228347.58	3013	249284.21	2760
20	91589.63		228166 93	3009	249118.74	2756
19	91577.95		227986.52	3005	248953.52	2752
18	91566.26		227806.36	3001	248788.54	2748
17	91554.56	195	227626.43	2997	248623.80	2744
16	91542.66		227449.74	2993	248459.29	2740
15	91531.15		227267.29	2989	248295.03	2736
14	91519.43		227088.07	2985	248131.00	2732
13	91507.70		226909.09	2981	247967.21	2728
12	91495.97		226730.35	2977	247803.66	2724
11	91484.22		226551.84	2973	247640.34	2720
10	91472.47		226373.57	2970	247477.26	2716
9	91460.72	196	226195.53	2966	247314.42	2712
8	91448.95		226017.73	2962	247151.81	2709
7	91437.18		225840.16	2958	246989.43	2705
6	91425.40		225662.83	2954	246827.29	2701
5	91413.61		225485.72	2950	246665.38	2697
4	91401.81		225308.85	2946	246503.71	2693
3	91390.00		225132.21	2942	246342.27	2689
2	91378.19		224955.80	2939	246181.06	2685
1	91366 37	197.	224779.61	2934	246020.08	2681
0	91354.55		224603.68	2931	245859.33	2677

24. Grad.

	Sinus	10''	Tangens	10''	Secans	10''
0	40673.66		44522.87		109463.63	
1	40700.24	443	44557.73	581	109477.81	236
2	40726.80		44592.60		109492.01	
3	40753.37		44627.47		109506.22	
4	40779.93		44662.36		109520.44	237
5	40806.49		44697.26	582	109534.67	
6	40833.05		44732.16		109548.92	
7	40859.60	442	44767.08		109563.18	
8	40886.15		44802.00		109577.46	238
9	40912.69		44836.93		109591.74	
10	40939.23		44871.87		109606.04	
11	40965.77		44906.82	583	109620.36	
12	40992.30		44942.78		109634.68	
13	41018.83		44976.75		109649.02	239
14	41045.36		45011.73		109663.37	
15	41071.88		45046.71		109677.74	
16	41098.41		45081.71		109692.12	
17	41124.92		45116.72		109706.51	240
18	41151.44		45151.73	584	109720.91	
19	41177.95		45186.75		109735.33	
20	41204.45		45221.79		109749.76	
21	41230.95		45256.83		109764.20	
22	41257.45		45291.88		109778.66	241
23	41283.95		45326.94		109793.13	
24	41310.44	441	45362.01	585	109807.61	
25	41336.93		45397.09		109822.11	
26	41363.42		45432.18		109836.62	
27	41389.90		45467.28		109851.14	242
28	41416.38		45502.38		109865.68	
29	41442.85		45537.50		109880.22	
30	41469.32		45572.62		109894.79	

67. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	91354.55		224603.68		245859.33	
59	91342.71	197	224427.96	2927	245698.82	2674
58	91330.87		224252.47	2923	245538.53	2670
57	91319.02		224077.21	2919	245378.48	2666
56	91307.16		223902.18	2916	245218.65	2662
55	91295.29		223727.38	2912	245059.05	2658
54	91283.42	198	223552.80	2908	244899.68	2655
53	91271.54		223378.45	2904	244740.54	2651
52	91259.65		223204.33	2900	244581.63	2647
51	91247.75		223030.43	2899	244422.94	2644
50	91235.84		222856.76	2893	244264.48	2639
49	91223.93		222683.31	2889	244106.24	2636
48	91212.01		222510.09	2885	243948.23	2632
47	91200.08		222337.09	2882	243790.45	2628
46	91188.15	199	222164.32	2878	243632.89	2624
45	91176.20		221991.77	2874	243475.55	2621
44	91164.25		221813.44	2870	243318.44	2617
43	91152.29		221647.33	2867	243161.55	2613
42	91140.33		221475.45	2863	243004.89	2601
41	91128.35		221303.79	2860	242848.44	2606
40	91116.37		221132.34	2856	242692.22	2602
39	91104.38		220961.12	2852	242536.22	2599
38	91092.38	200	220790.12	2849	242380.44	2595
37	91080.38		220619.34	2845	242224.88	2591
36	91068.37		220448.78	2841	242069.54	2587
35	91056.35		220278.43	2838	241914.42	2584
34	91044.32		220108.31	2834	241759.52	2580
33	91032.28		219938.40	2830	241604.84	2577
32	91020.24		219768.71	2827	241450.38	2573
31	91008.09		219599.23	2823	241296.13	2569
30	90996.13		219429.97	2819	241142.10	2566

24. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	41469.32		45572.62		109894.79	
31	41495.79	441	45607.76	586	109909.36	243
32	41522.26		45642.90		109923.95	
33	41548.72		45678.06		109938.55	
34	41575.17		45713.22		109953.16	
35	41601.63		45748.39		109967.79	
36	41628.80		45783.57		1099982.4	244
37	41654.53		45818.76	587	109997.09	
38	41680.97		45853.97		110011.75	
39	41707.41		45889.17		110026.43	
40	41733.84		45924.39		110041.13	245
41	41760.28		45959.62		110055.84	
42	41786.71	440	45994.86		110070.56	
43	41813.13		46030.11		110085.29	
44	41839.55		46065.36	588	110100.05	
45	41865.97		46100.63		110114.80	246
46	41892.39		46135.91		110129.57	
47	41918.80		46171.19		110141.35	
48	41945.21		46206.49		110159.16	
49	41971.61		46241.79		110173.97	247
50	41998.01		46277.10	589	110188.79	
51	42024.41		46318.43		110203.64	
52	42050.80		46347.76		110218.49	
53	42077.19		46383.10		110233.35	
54	42103.58		46418.45		110248.23	248
55	42129.96		46453.82		110263.13	
56	42156.34		46489.19	590	110278.03	
57	42182.72		46524.57		110292.95	
58	42209.09		46559.96		110307.88	249
59	42235.46		46595.36		110322.83	
60	42261.83	439	46630.77		110337.79	

65. Grad.

	Sinus	0''	Tangens.	10	Secans.	10''
30	90996.13		219429.97		241142.10	
29	90984.06	01	219260.93	2816	240988.29	2562
28	90971.99		219092.10	2812	240834.69	2558
27	90959.9[illegible]		218923.49	2809	240681.32	2555
26	90947.31		218755.10	2805	240528.15	2551
25	90935.72		218586.91	2802	240375.20	2548
24	90923.61		218418.94	2798	240222.47	2544
23	90911.50		218251.19	2794	240069.95	2540
22	90899.74	202	218083.64	279	239917.64	2537
21	9 887.25		2179[illegible]6.31	2787	239765.55	2533
20	90875.11		217749.20	2784	239613.67	2530
19	90862.97		217582.29	2780	239462.01	2526
18	90850.82		217415.59	2777	239310.55	2523
17	90838.66		217249.11	2773	239159.31	2520
16	90826.49		217082.83	2770	239008.28	2516
15	90814.32	203	216916.77	2766	238857.46	2512
14	90802.13		216750.91	2763	238706.85	2509
13	90789.94		216585.27	2759	238556.45	2505
12	90777.75		216419.83	2756	238406.25	2502
11	90765.54		216254.60	2752	238256.27	2498
10	90753.33		216089.58	2749	238106.50	2495
9	90741.11		215924.76	2745	237956.93	2491
8	90728.88		215760.15	2742	237807.58	2488
7	90716.64	204	215595.75	2739	237658.43	2484
6	90704.4[illegible]		215431.56	2735	237509.48	2481
5	90692.15		215267.57	2732	237360.75	2477
4	9 679.89		215103.78	2728	237212.22	2474
3	90667.62		214940.20	2725	237063.90	2471
2	90655.35		214776.83	2721	236915.78	2467
1	90643.07		214613.66	2718	236767.87	2464
0	90630.78		214459.69	2715	236620.16	2460

25. Grad.

′	Sinus	10″	Tangens.	10″	Secans.	10″
0	42261.83		46630.77		110337.79	
1	42288.19	439	46666.18	596	110352.76	249
2	42314.55		46701.61	591	110367.75	
3	42340.90		46737.05		110382.75	250
4	42357.25		46772.50		110397.77	
5	42393.60		46807.96		110412.79	
6	42419.94		46843.42		110427.83	
7	42446.28		46878.90		110442.89	251
8	42472.62		46914.39		110457.95	
9	42498.95		46949.88	592	110473.03	
10	42525.28		46985.39		110488.13	
11	42551.61		47020.90		110503.24	
12	42577.93		47056.43		110518.36	252
13	42604.25		47091.96		110533.49	
14	42630.56		47127.51		110548.64	
15	42656.87	438	47163.06	593	110563.80	
16	42683.18		47198.63		110578.98	253
17	42709.49		47234.20		110594.17	
18	42735.79		47269.78		110609.37	
19	42762.08		47305.38		110624.58	
20	42788.38		47340.98		110639.81	254
21	42814.67		47376.59	594	110655.06	
22	42840.95		47412.22		110670.31	
23	42867.23		47447.85		110685.58	
24	42893.51		47483.49		110700.87	
25	42919.79		47519.14		110716.16	255
26	42946.06		47554.81		110731.47	
27	42972.33		47590.48	595	110746.80	
28	42998.59		47626.16		110762.14	
29	43024.85		47661.85		110777.49	256
30	43051.11		47697.55		110792.85	

64. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
60	90630.78		214459.69		236620.16	
59	90618.48	205	214282.93	2711	236472.65	2457
58	90606.18		214125.37	2708	236325.35	2454
57	90593.86		213963.01	2705	236178.26	2450
56	90581.54		213800.85	2701	236031.36	2447
55	90569.22		213638.89	2698	235884.67	2443
54	90556.88		213477.14	2694	235738.18	2440
53	90544.54		213315.59	2691	235591.89	2437
52	90532.19		213154.23	2688	235445.81	2433
51	90519.83	206	212993.08	2684	235299.92	2430
50	90507.46		212832.13	2681	235154.23	2427
49	90495.09		212671.37	2678	235008.75	2423
48	90482.70		212510.82	2675	234863.47	2420
47	90470.32		212350.46	2671	234718.38	2417
46	90457.92		212190.30	2668	234573.49	2413
45	90445.51		212030.34	2665	234428.80	2410
44	90433.10		211870.57	2661	234284.31	2407
43	90420.68	207	211711.01	2658	234140.02	2403
42	90408.25		211551.64	2655	233995.93	2400
41	90395.82		211392.46	2652	233852.03	2397
40	90383.38		211233.48	2648	233708.53	2394
39	90370.93		211074.70	2645	233564.82	2390
38	90358.47		210916.11	2642	233421.52	2387
37	90346.00		210757.71	2639	233278.40	2384
36	90333.53		210599.51	2635	233135.48	2381
35	90321.05	208	210441.50	2632	232992.76	2377
34	90308.56		210283.69	2629	232850.23	2374
33	90296.06		210126.07	2626	232707.90	2371
32	90283.56		209968.64	2622	232565.75	2368
31	90271.05		209811.40	2619	232423.81	2364
30	90258.53		209654.36	2616	232282.05	2361

25. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	43051.11		47697 55		110792.85	
31	43077.36	438	47733.26	595	110808.23	256
32	43103.61	437	47768.99		110823.63	
33	43129.86		47804.72	596	110839.03	
34	43156.10		47840.46		110854.45	257
35	43182.34		47876.21		110869.90	
36	43208.57		47911.97		110885.33	
37	43234 81		47947.74		110900.79	
38	43261.03		47983.52		110916.27	258
39	43287.26		48019.32	597	110931.76	
40	43313.48		48055.12		110947.26	
41	43339.69		48090.93		110962.77	
42	43365.91		48126.75		110978 30	259
43	43392.12		48162.58		110993.85	
44	43418.32		48198.42		111009.40	
45	43444.53		48234.27	598	111024.98	
46	43470.72		48270 13		111040.56	
47	43496.92		48306.01		111056.16	260
48	43523.11	436	48341.89		111071,77	
49	43549.30		48377.78		111087.40	
50	43575.48		48413.68		111103.03	
51	43601.66		48449.59	599	111118.69	261
52	43627.84		48485.52		111134.36	
53	43654.01		48521.45		111150.04	
54	43680.18		48557.39		111165.73	
55	43706.34		48593.34		111181.44	
56	43732.51		48629.31		111197,16	262
57	43758.66		48665.28	600	111212.90	
58	43784.82		48701.26		111228 65	
59	43810.97		48737.25		111244.43	263
60	43837.11		48773.26		111260.19	

64. Grad.

	Sinus	10''	Tangens	10''	Secans	10''
30	90258.53		209654.36		232282.05	
29	90246.00	208	209497.51	2613	232140.49	2358
28	90233.47	209	209340.84	2601	231999.11	2355
27	90220.92		209184.37	2607	231857.94	2352
26	90208.37		209028.09	2603	231716.95	2348
25	90195.82		208872.00	2600	231576.15	2345
24	90183.25		208716.10	2597	231435.54	2342
23	90170.68		208560.39	2594	231295.13	2339
22	90158.10		208404.86	2591	231154.90	2336
21	90145.51		208249.53	2588	231014.86	2333
20	90132.92	210	208094.38	2584	230875.01	2329
19	90120.31		207939.42	2581	230735.35	2326
18	90107.70		207784.65	2578	230595.88	2323
17	90095.08		207630.07	2575	230456.60	2320
16	90082.46		207475.67	2572	230317.51	2317
15	90069.82		207321.46	2569	230178.60	2314
14	90057.18		207167.43	2566	230039.88	2311
13	90044.53		207013.59	2563	229901.34	2308
12	90031.88	211	206859.93	2560	229762.99	2305
11	90019.21		206706.46	2557	229624 83	2301
10	90006.54		206553.18	2553	229486.35	2298
9	89992.86		206400.08	2550	229349 06	2295
8	89981.17		206247.16	2547	229211.45	2292
7	89968.48		206094.42	2544	229074.03	2289
6	89955.78		205941.87	2541	228936.79	2286
5	89943.07		205789.50	2538	228799.74	2283
4	89930 15	212	205637.32	2535	228663.86	2280
3	89917.62		205485.31	2532	228526.18	2277
2	89904 89		205333.49	2529	228389.67	2274
1	89892.35		205181.84	2526	228253.34	2271
0	89879.40		205030.38	2523	228117.20	2268

26. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	43837.11		48773.26		111260.19	
1	43863.26	436	48809.27	600	111275.99	263
2	43889.40		48845.30		111291.79	
3	43915.53		48881.33	601	111307.61	
4	43941.66	435	48917.37		111323.45	264
5	43967.79		48953.43		111339.29	
6	43993.92		48989.49		111355.15	
7	44020.04		49025.57		111371.03	
8	44046.15		49061.65		111386.92	265
9	44072.27		49097.75	602	111402 82	
10	44098.38		49133.86		111418.74	
11	44124.48		49169.97		111434.67	
12	44150.58		49206.10		111450.62	
13	44176.68		49242.24		111466.58	266
14	44202.78		49278.38		111482.55	
15	44228.87		49314.54	603	111498.54	
16	44254.96		49350.71		111514.54	
17	44281.04		49386.89		111530.56	267
18	44307.12		49423.08		111546.58	
19	44333.19		49459.28		111562.63	
20	44359.27	434	49495.49	604	111578.69	
21	44385.33		49531.71		111594.76	268
22	44411.40		49567.94		111610.84	
23	44437.46		49604.18		111626.94	
24	44463.52		49640.43		111643.06	
25	44489.57		49676.69		111659.19	
26	44515.62		49712.97	605	111675.33	269
27	44541.67		49749.25		111691.48	
28	44567.71		49785.54		111707.65	
29	44593.75		49821.85		111723.84	
30	44619.78		49858.16		111740.04	270

63. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	89879.40		205030.38		228117.20	
59	89866.65	212	204879.10	2520	227981.24	2265
58	89853.89		204728.00	2517	227845.46	2262
57	89841.11		204577.08	2514	227709.86	2259
56	89828.34	213	204426.34	2511	227574.45	2256
55	89815.55		204275.78	2508	227439.21	2253
54	89802.76		204125.40	2505	227304.15	2250
53	89789.96		203975.19	2502	227169.27	2247
52	89777.15		203825.17	2499	227034.57	2244
51	89764.33		203675.32	2496	226900.05	2241
50	89751.51		203525.65	2493	226765.71	2238
49	89738.68		203376.15	2490	226631.55	2235
48	89725.84	214	203226.83	2487	226497.56	2232
47	89712.99		203077.69	2484	226363.75	2229
46	89700.14		202928.73	2482	226230.12	2226
45	89687.28		202779.94	2479	226096.67	2223
44	89674.40		202631.33	2476	225963.39	2220
43	89661.53		202482.89	2473	225830.29	2217
42	89648.64		202334.62	2470	225697.36	2214
41	89635.75		202186.53	2467	225564.61	2211
40	89622.85	215	202038.62	2464	225432.04	2208
39	89609.94		201890.88	2461	225299.64	2205
38	89597.03		201743.31	2458	225167.41	2203
37	89584.11		201595.97	2455	225035.36	2200
36	89571.18		201448.69	2452	224903.48	2197
35	89558.24		201301.64	2450	224771.78	2194
34	89545.29		201154.77	2447	224640.24	2191
33	89532.34		201008.06	2444	224508.89	2188
32	89519.38	216	200861.53	2441	224377.70	2185
31	89506.41		200715.16	2438	224246.69	2182
30	89493.44		200568.97	2435	224115.84	2180

26. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
30	44619.78		49858.16		111740.04	
31	44645.81	434	49894.45	605	111756.26	270
32	44671.84		49930.82	606	111772.48	
33	44697.86		49967.17		111788.72	
34	44723.88		50003.52		111804.97	271
35	44749.90		50039.89		111821.24	
36	44775.91	433	50076.27		111837.53	
37	44801.92		50112.66	607	111853.83	
38	44827.32		50149.06		111870 14	272
39	44853.92		50185 47		11 886.46	
40	44879.92		50221.89		111902.81	
41	44905.91		50258.32		111919.16	
42	44931.90		50294.76		111935.53	273
43	44957 88		50331.21	608	111951.91	
44	44983.87		50367.67	/	111968.31	
45	45009.84		50404.15		111984.72	
46	45035.82		50440.63		112001.15	
47	45061.79		50477.13		112017.59	274
48	45087.75		50513.63		112034.04	
49	45113 72		50550.15	609	112050.51	
50	45139.67		50586.68		112066.99	
51	45165.63		50623.22		112083.50	275
52	45191.58	432	50659.77		112100.01	
53	45217.53		50696.32		112116.53	
54	45243.47		50732.90	610	112133.08	
55	45269.41		50769.48		112149.63	276
56	45295.35		50806.07		112166.20	
57	45321.28		50842.67		112182.78	
58	45347.21		50879.28		112199.38	
59	45373.13		50915.91		112215.99	277
60	45399.05		50952.54	611	112232.62	

63. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	89493.44		200568.97		224115.84	
29	89480.45	216	200422.95	2433	223985.17	2177
28	89467.46		200277.10	2430	223854.67	2174
27	89454.46		200131.41	2427	223724.35	2171
26	89441.46		199985.90	2424	223594.19	2168
25	89428.44		199840.56	2421	223464.20	2165
24	89415.42	217	199695.39	2418	223334.38	2162
23	89402.39		199550.38	2416	223204.73	2160
22	89389.36		199405.54	2413	223075.26	2157
21	89376.31		199260.87	2401	222945.95	2154
20	89363.26		199116.37	2407	222816.81	2151
19	89350.20		198904.72	2404	222687.83	2148
18	89337.14		198827.87	2402	222559.03	2146
17	89324.06	218	198683.87	2399	222430.39	2143
16	89310 98		198540.03	2397	222301.92	2140
15	89297.89		198396.36	2393	222173.62	2137
14	89284.80		198252.86	2391	222045.48	2134
13	89271.69		198109.52	2388	221917.51	2132
12	89258.58		197966.35	2386	221789.71	2129
11	89245.46		197823.34	2382	221662.07	2126
10	89232.34		197680.50	2380	221534.60	2123
9	89219.20	219	197537.82	2377	221407.30	2121
8	89206.06		197395.31	2374	221280.16	2118
7	89192.91		197252 96	2371	221153.18	2115
6	89179.75		197110.77	2369	221026.37	2112
5	89166.59		196968.74	2366	220899.72	2110
4	89153.42		196826.88	2363	220773.23	2107
3	89140.24		196685.18	2361	220646.91	2104
2	89127.05		196543.64	2358	220520.75	2101
1	89113.85	220	196402.27	2355	220394 76	2099
0	89100.65		196261.05	2352	220268.93	2096

27. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	45399.05		50952.54		112232.62	
1	45424.97	432	56989.19	611	112249.27	277
2	45450.38		51025.85		112265.92	
3	45476.79		51062.52		112282.59	278
4	45502.69		51099.19		112299.28	
5	45528.59		51135.88	612	112315.98	
6	45554.49		51172.58		112332.69	
7	45580.38		51209.30		112349.42	
8	45606.27	431	51246.02		112366.16	279
9	45632.16		51282.75		112382.92	
10	45658.04		51319.50		112399.69	
11	45683.92		51356.25	613	112416.48	
12	45709.79		51393.02		112433.28	280
13	45735.66		51429.80		112450.09	
14	45761.53		51466.58		112466.93	
15	45787.39		51503.38		112483.77	
16	45813.25		51540.19	514	112500.63	281
17	45839.10		51577.02		112517.50	
18	45864.95		51613.85		112534.39	
19	45890.80		51650.69		112551.29	
20	45916.64		51687.55		112568.21	282
21	45942.48		51724.41		112585.14	
22	45968.32		51761.29	615	112602.09	
23	45994.15	430	51798.18		112619.05	
24	46019.98		51835.08		112636.03	283
25	46045.80		51871.99		112653.02	
26	46071.62		51908.91		112670.03	
27	46097.44		51945.84	616	112687.05	
28	46123.25		51982 78		112704.08	284
29	46149.06		52019.74		112721.13	
30	46174.86		52056.70		112738.19	

62. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	89100.65		196261.05		220268.93	
59	89087.44	220	196120.00	2350	220143.26	2093
58	89074.22		195979.10	2347	220017.75	2091
57	89061.00		195838.37	2344	219892.40	2088
56	89047.77		195697.80	2342	219767.21	2085
55	89034.53		195557.39	2340	219642.19	2083
54	89021.28		195417.15	2336	219517.33	2080
53	89008.02	221	195277.04	2334	219392.62	2077
52	88994.76		195137.11	2331	219268.08	2075
51	88981.49		194997.33	2328	219143.70	2072
50	88968.21		194857.71	2326	219019.47	2069
49	88954.93		194718.26	2323	218895.41	2067
48	88941.64		194578.96	2321	218771.50	2064
47	88928.34		194439.81	2318	218647.75	2061
46	88915.03		194300.83	2315	218524.17	2059
45	88901.71	222	194162.00	2313	218400.74	2056
44	88888.39		194023.33	2310	218277.46	2053
43	88875.06		193884.81	2308	218154.35	2051
42	88861.72		193746.45	2305	218031.39	2048
41	88848.38		193608.25	2302	217908.59	2046
40	88835.02		193470.20	2200	217785.94	2043
39	88821.66		193332.31	2297	217663.46	2040
38	88808.30		193194.57	2295	217541.12	2038
37	88794.92	223	193056.98	2292	217418.95	2035
36	88781.54		192919.56	2289	217296.93	2033
35	88768.15		192782.28	2287	217275.06	2030
34	88754.75		192645.16	2284	217053.35	2027
33	88741.34		192508.19	2282	216931.8	2025
32	88727.93		192371.38	2279	216810.40	2022
31	88714.51		192234.72	2277	216689.15	2020
30	88701.08		192098.21	2275	216568.06	2017

27. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	46174.86		52056.70		112738.19	
31	46200.66	430	52093.68	616	112755.27	284
32	46226.46		52130.67	617	112772.37	285
33	46252.25		52167.67		112789.47	
34	46278.04		52204.68		112806.60	
35	46303.82		52241.70		112823.74	
36	46329.60		52278.74		112840.89	286
37	46355.38		52315.78		112858.06	
38	46381.15	429	52352.84	618	112875.24	
39	46406.92		52389.90		112892.44	
40	46432.69		52426.98		112909.65	287
41	46458.45		52464.45		112926.87	
42	46484.20		52501.17		112944.12	
43	46509.96		52538.29	619	112961.37	
44	46535.71		52575.41		112978.64	288
45	46561.45		52612.54		112995.93	
46	46587.19		52649.69		113013.23	
47	46612.93		52686.85		113030.54	
48	46638.66		52724.02	620	113047.88	289
49	46664.39		52761.20		113065.22	
50	46690.12		52798.39		113082.58	
51	46715.84		52835.59		113099.96	
52	46741.56		52872.81		113117.35	290
53	46767.27		52910.04	621	113134.75	
54	46792.98	428	52947.27		113152.17	
55	46818.69		52984.52		113169.61	
56	46844.39		53021.78		113187.06	291
57	46870.09		53059.06		113204.52	
58	46895.78		53096.34		113222.00	
59	46921.47		53133.64	622	113239.49	
60	46947.16		53170.94		113257.00	292

62. Grad.

	Sinus	10"	*Tangens*	10"	*Secans*	10"
30	88701.08		192098.2[illegible]		216568.06	
29	88687.65	224	191961.86	2272	216447.12	2015
28	88674.20		191825.65	2265	216326.33	2012
27	88660.75		191689.60	2266	216205.70	2009
26	88647.30		191553.70	2264	216085.22	2007
25	88633.83		191417.95	226[illegible]	215964.89	2004
24	88620.36		191282.36	2259	215844.71	2002
23	88606.88		191146.91	2256	215724.69	1999
22	88593.39		191011.61	2254	215604.82	1997
21	88579.90	225	190876.47	2251	215485.10	1994
20	88566.39		190741.47	2249	215365.53	1992
19	88552.88		190606.63	2247	215246.11	1989
18	88539.36		190471.93	2244	215126.84	1987
17	88525.84		190337.38	2241	215007.72	1984
16	88512.30		190202.99	2239	214888.75	1982
15	88498.76		190068.74	2236	214769.93	1979
14	88485.23		189934.63	2234	214651.27	1977
13	88471.66	226	189800.68	2232	214[illegible]32.75	1974
12	88458.09		189666.88	2229	214414.37	1972
11	88444.53		189533.22	2227	214296.15	1969
10	88430.95		189399.71	2224	214178.08	1967
9	88417.36		189266.34	2222	214060.15	1965
8	88403.77		189133.1[illegible]	2219	213942.38	1962
7	88390.17		189000.06	2217	213824.75	1959
6	88376.56		188867.13	2214	213707.26	1957
5	88362.95	227	188734.36	2211	213589.93	1955
4	88349.32		188601.72	2209	2[illegible]3472,74	1952
3	88335.69		188469.24	2207	213355.70	1950
2	88322.06		188336 89	2205	213238 80	1947
1	88308.41		188204.70	2202	213122.05	1945
0	88294.76		188072.65	2100	213005.45	1942

28. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	46947.16		53170.94		113257.00	
1	46972.84	428	53208.26	622	113274.53	292
2	46998.52		53245.59		113292.07	
3	47024.19		53282.93		113309.62	
4	47049.86		53320.29	623	113327.19	293
5	47075.53		53357.65		113344.78	
6	47101.19		53395.03		113362.38	
7	47126.85		53432.41		113379.99	
8	47152.50		53469.81		113397.62	294
9	47178.15	427	53507.23	624	113415.27	
10	47203.80		53544.65		113432.93	
11	47229.44		53582.08		113450.60	
12	47255.08		53619.53		113468.29	295
13	47280.71		53656.99		113486.00	
14	47506.34		53694.46	625	113503.72	
15	47331.97		53731.94		113521.46	
16	47357.59		53769.43		113523.91	296
17	47383.21		53806.94		113556.97	
18	47408.82		53844.45		113574.75	
19	47434.43		53881.98	626	113592.55	
20	47460.04		53919.52		113610.36	297
21	47485.64		53957.07		113628.19	
22	47511.24		53994.64		113646.03	
23	47536.83		54032.21		113663.89	
24	47562.42	426	54069.80	627	113681.76	298
25	47588.01		54107.40		113699.65	
26	47613.59		54145.01		113717.55	
27	47639.17		54182.63		113735.47	
28	47664.74		54220.26		113753.40	299
29	47690.31		54257.91	628	113771.35	
30	47715.88		54295.57		113789.32	

61. Grad.

	Sinus	10''	Tangens	10''	Secans	10''
60	88294.76		183072.65		213005.45	
59	88281.09	227	187940.74	2197	212888.99	1940
58	88267.43		187808.97	2195	212772.67	1938
57	88253.76		187677.36	2193	212656.51	1935
56	88240.07	228	187545.88	2190	212540.48	1933
55	88226.38		187414.55	2189	212424.60	1930
54	88212.69		187283.36	2185	212308.87	1928
53	88198.98		187152.31	2183	212193.28	1926
52	88185.27		187021.41	2181	212077.83	1923
51	88171.55		186890.64	2177	211962.53	1921
50	88157.82		186760.03	2176	211847.37	1918
49	88144.09	229	186629.55	2174	211732.35	1916
48	88130.34		186499.21	2171	211617.48	1914
47	88116.60		186369.02	2169	211502.74	1911
46	88102.84		186238.96	2167	211388.15	1909
45	88089.07		186109.05	2164	211273.71	1906
44	88075.30		185979.28	2162	211159.40	1904
43	88061.52		185849.65	2160	211045.23	1902
42	88047.73		185720.15	2157	210931.21	1809
41	88033.94		185590.80	2155	210817.33	1897
40	88020.14	230	185461.59	2153	210703.59	1895
39	88006 33		185332.52	2150	210589.98	1892
38	87992.51		185203.58	2148	210476.52	1890
37	87978.69		185074.79	2146	210363.20	1888
36	87964.86		184946.13	2143	210250.02	1885
35	87951.02		184817.61	2141	210136.98	1883
34	87937 17		184689.23	2139	210024.08	1881
33	87923.32	231	184560.99	2136	209911.31	1878
32	87909.46		184432.89	2134	209798.69	1876
31	87895.59		184304.92	2132	209686 20	1874
30	87881.71		184177.09	2130	209573.85	1871

28. Grad.

	Sinus	10''	Tangens	10''	Secans	10′
30	47715.88		54295.57		113789.32	
31	47741.44	426	54333.24	628	113807.30	299
32	47766.99		54370.92		113825.29	300
33	47792.55		54408.62		113843.30	
34	47818.10		54446.32		113861.43	
35	47843.64		54484.04	629	113879.37	
36	47869.19		54521.77		113897.42	301
37	47894.72		54559.51		113915.50	
38	47920.26		54597.26		113933.58	
39	47945.79	425	54635.03		113951.69	
40	47971.31		54672.81	630	113969.80	302
41	47996.83		54710.60		113987.94	
42	48022.35		54748.40		114006.08	
43	48047.86		54786.21		114024.25	
44	48073.37		54824.04		114042.43	303
45	48098.88		54861.88	631	114060.62	
46	48124.38		54899.73		114078.83	
47	48149.87		54937.59		114097.06	
48	48175.37		54975.46		114115.30	304
49	48200.86		55013.35	632	114133.56	
50	48226.34		55051.25		114151.83	
51	48251.82		55089.16		114170.12	
52	48277.30		55127.08		114188.42	305
53	48302.77	424	55165.02		114206.74	
54	48328.24		55202.97	633	114225.07	
55	48353.70		55240.92		114243.42	306
56	48379.16		55278.90		114261.79	
57	48404.62		55316.88		114280.17	
58	48430.07		55354.88		114298.57	
59	48455.52		55392.82	634	114316.98	307
60	48480.96		55430.90		114335.41	

61. Grad.

	Sinus	10''	*Tangens.*	10	*Secans.*	10''
30	87881.71		184177.09		209573.85	
29	87867.83	231	184049.39	2127	209461.64	1869
28	87853.94		183921.84	2125	209349.57	1867
27	87840.03		183794.42	2123	209237.64	1865
26	87826.13		183667.33	2120	209125.84	1862
25	87812.22		183539 99	2118	209014.18	1860
24	87798.30	232	183412.97	2116	208902.65	1858
23	87784.37		183286.10	2114	208791.27	1855
22	87770.43		183159.36	2111	208680.02	1853
21	87756.49		183032.75	2109	208568.90	1851
20	87742.54		182906.28	2107	208457.92	1849
19	87728.58		182779.94	2105	208347.08	1846
18	87714.62		182653.74	2102	208236.37	1844
17	87700.64		182527.67	2100	208125.80	1842
16	87686.66	233	182401.73	2098	208015.36	1840
15	87672,68		182275.93	2096	207905.06	1837
14	87658.68		82150.26	2094	207794.89	1835
13	87644.68		182024.73	2091	207684.86	1833
12	87630.67		81899.32	2089	207574.96	1831
11	87616.65		181774.04	2087	207465.19	1828
10	87602.63		181648.92	2085	207355.56	1826
9	87588.59		181523.91	2082	207246.06	1824
8	87574.55	234	181399.04	2080	207136.70	1822
7	87560.51		81274.30	2078	207021.46	1820
6	87546.45		181149.69	2076	206918.36	1817
5	87532.39		181025.21	2074	206809.40	1815
4	87518.32		180900.86	2072	206700 56	1813
3	87504.24		180776.64	2069	206591.86	1811
2	87490.16		180652.56	2067	206483.28	1809
1	87476 07		180528.60	2065	206374.84	1806
0	87461.97	235	180404.78	2063	206266.53	1804

29. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	48480.96		55430.90		114335.41	
1	48506.40	424	55468.94	634	114353.85	307
2	48531.84		55506.98		114372.31	
3	48557.27		55545.04		114390.78	308
4	48582.70		55583.11	635	114409.27	
5	48608.12		55621.19		114427.78	
6	48633.54		55659.29		114446.30	
7	48658.95		55697.39		114464.84	309
8	48684.36	423	55735.51		114483.39	
9	48709.77		55773.64	636	114501.96	
10	48735.17		55811.79		114520.55	
11	48760.57		55849.94		114539.15	310
12	48785.97		55888.11		114557.76	
13	48811.36		55926.29		114576.39	
14	48836.74		55964.48	637	114595.04	
15	48862.12		56002.69		114613.71	311
16	48887.50		56040.91		114632.38	
17	48912.88		56079.14		114651.08	
18	48938.24		56117.38		114669.79	312
19	48963.61		56155.64	638	114688.52	
20	48988.97		56193.91		114707.26	
21	49014.33		56232.19		114726.02	
22	49039.68	422	56270.48		114744.79	313
23	49065.03		56308.78		114763.58	
24	49090.37		56347.10	639	114782.39	
25	49115.72		56385.43		114801.21	
26	49141.05		56423.78		114820.94	314
27	49166.38		56462.13		114838.90	
28	49191.71		56500.63	640	114857.77	
29	49217.04		56538.88		114876.65	
30	49242.36		56577.28		114895.55	315

60. Grad.

	Sinus	10"	Tangens.	10	Secans.	10"
60	87461.97		180404.78		206266.53	
59	87447.86	235	180281.08	2061	206158.36	1802
58	87433.75		180157.51	2059	206050.31	1800
57	87419.63		180034.08	2056	205942.39	1798
56	87405.50		179910.77	2054	205834.60	1796
55	87391.37		179787.59	2052	205726.95	1793
54	87377.22		179664.54	2050	205619.42	1791
53	87363.07		179541.62	2048	205512.03	1789
52	87348.91	236	179418.82	2046	205404.76	1787
51	87334.75		179296.16	2043	205297.62	1785
50	87320.57		179173.62	2041	205190.61	1783
49	87306.39		179051.21	2039	205083.73	1780
48	87292.21		178928.93	2037	204976.98	1778
47	87278.03		178806.78	2035	204870.36	1776
46	87263.81		178684.75	2033	204763.86	1774
45	87249.60		178562.85	2031	205657.50	1772
44	87235.38	237	178441.07	2029	204551.26	1770
43	87221.16		178319.43	2027	204445.15	1768
42	87206.93		178197.90	2024	204339.16	1766
41	87192.69		178076.51	2022	204233.30	1763
40	87178.44		177955.24	2020	204127.57	1761
39	87164.19		177834.09	2018	204021.97	1759
38	87149.93		177713.07	2016	203916.49	1757
37	87135.66		177592.18	2014	203811.14	1755
36	87121.38	238	177471.41	2012	203705.92	1753
35	87107.09		177350.76	2010	203600.82	1751
34	87092.81		177230.24	2008	203495.85	1749
33	87078.51		177109.85	2006	203391.00	1747
32	87064.20		176989.57	2004	203286.27	1745
31	87049.89		176869.43	2002	203181.68	1742
30	87035.57		176749.40	2000	203077.20	1740

29. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	49242.36		56577.28		114895.55	
31	49267.67	422	56615.68	640	114914.47	315
32	49292.98		56654.10		114933.40	
33	49318.29		56692.53	641	114952.35	316
34	49343.59		56730.98		114971.32	
35	49368.89		56769.44		114990.30	
36	49394.19		56807.91		115009.30	
37	49419.48	421	56846.39		115028.31	317
38	49444.76		56884.88	642	115047.34	
39	49470.05		56923.39		115066.38	
40	49495.32		56961.91		115085.44	
41	49520.60		57000.45		115104.52	318
42	49545.87		57038.99	643	115123.61	
43	49571.13		57077.55		115142.72	
44	49596.39		57116.12		115161.85	
45	49621.65		57154.71		115180.99	319
46	49646.90		57193.31		115200.15	
47	49672.15		57231.92	644	115219.32	
48	49697.40		57270.54		115238.51	320
49	49722.64		57309.18		115257.72	
50	49747.87		57347.82		115276.94	
51	49773.10	420	57386.49		115296.18	
52	49798.33		57425.16	645	115315.43	321
53	49823.55		57463.85		115334.70	
54	49848.77		57502.55		115353.99	
55	49873.99		57541.26		115373.29	
56	49899.20		57579.99	646	115392.61	322
57	49924.41		57618.73		115411.95	
58	49949.61		57657.48		115431.30	
59	49974.81		57696.25		115450.67	323
60	50000.00		57735.03		115470.05	

60. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	87035.57		176749.40		203077.20	
29	87021.24	238	176629.50	1997	202972.86	1738
28	87006.91	239	176509.72	1995	202868.63	1736
27	86992.56		176390.07	1993	202764.53	1734
26	86978.21		176270.53	1991	202660.56	1732
25	86963.86		176151.12	1989	202556.70	1730
24	86949.49		176031.83	1987	202452.97	1728
23	86935.12		175912.67	1985	202349.37	1726
22	86920.74		175793.62	1983	202245.89	1724
21	86906.35		175674.70	1981	202142.53	1722
20	86891.96		175555.90	1979	202039.29	1720
19	86877.56	240	175437.22	1977	201936.17	1718
18	86863.15		175318.66	1975	201833.18	1716
17	86848.73		175200.23	1973	201730.31	1714
16	86834.31		175081.91	1971	201627.56	1712
15	868[illegible]9.88		174963.71	1969	201524.94	1710
14	86805.44		174845.64	1967	201422.43	1708
13	86790.99		174727.68	1965	201320.05	1706
12	86776.54		174609.84	1963	201217.79	1704
11	86762.08	241	174492.13	1961	201115.64	1702
10	86747.62		174374.53	1959	201013.62	1700
9	86733.14		174257.05	1957	200911.72	1698
8	86718.66		174139.69	1955	200809.94	1696
7	86704.17		174022.45	1953	200708.28	1693
6	86689.67		173905.33	1951	200606.74	1692
5	86675.17		173788.33	1949	200505.32	1690
4	86660.66		173671.44	1947	200404.02	1688
3	86646.14	242	173554.67	1945	200302.83	1686
2	86631.61		173438.03	1943	200201.77	1684
1	86617.08		173321.49	1941	200100.83	1682
0	86602.54		173205.08	1939	200000.00	1680

30. Grad.

	Sinus	10''	Tangens.	10''	Secans.	10''
0	50000.00		57735.03		115470.05	
1	50025.19	420	57773.82	647	115489.45	323
2	50050.37		57812.62		115508.87	324
3	50075.55		57851.44		115528.30	
4	50100.73		57890.27		115547.75	
5	50125.90		57929.11	648	115567.22	325
6	50151.07	419	57967.97		115586.70	
7	50176.24		58006.84		115606.20	
8	50201.40		58045.73		115625.72	
9	50226.55		58084.62		115645.25	326
10	50251.70		58123.53	649	115664.79	
11	50276.85		58162.45		115684.36	
12	50301.99		58201.39		115703.94	
13	50327.13		58240.34		115723.54	327
14	50352.27		58279.30		115743.15	
15	50377.40		58318.28	650	115762.78	
16	50402.52		58357.26		115782.43	328
17	50427.64		58396.27		115802.09	
18	50452.76		58435.28		115821.77	
19	50477.87	418	58474.31	651	115841.46	
20	50502.98		58513.35		115861.98	329
21	50528.09		58552.41		115880.91	
22	50553.19		58591.47		115900.65	
23	50578.28		58630.56		115920.41	330
24	50603.38		58669.65		115940.19	
25	50628.46		58708.76	652	115959.99	
26	50653.55		58747.88		115979.80	
27	50678.63		58787.02		115999.63	331
28	50703.70		58826.16	653	116019.47	
29	50728.77		58865.33		116039.33	
30	50753.84		58904.50		116059.21	

59. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	86602.54		173205.08		200000.00	
59	86587.99	243	173088.78	1937	199899.29	1678
58	86573.44		172972.60	1936	199798.70	1676
57	86558.87		172856.54	1934	199698.23	1674
56	86544.30		172740.60	1932	199597.88	1672
55	86529.73		172624.77	1930	199497.64	1670
54	86515.14		172509.05	1928	199397.53	1668
53	86500.55		172393.45	1926	199297.52	1666
52	86485.95		172277.97	1924	199197.64	1664
51	86471.34		172162.61	1922	199097.87	1662
50	86456.73	244	172047.36	1920	198998.22	1660
49	86442.11		171932.22	1918	198898.69	1658
48	86427.48		171817.20	1916	198799 27	1656
47	86412.84		171702.30	1914	198699.97	1654
46	86398.20		171587.51	1912	198600.80	1652
45	86383.55		171472.81	1910	198501.72	1650
44	86368 89		171358.27	1909	198402.76	1648
43	86354.23		171243.82	1907	198303.93	1646
42	86339.55	245	171129.49	1905	198205.20	1645
41	86324.87		171015.27	1903	198106.59	1643
40	86310.19		170901.16	1901	198008.10	1641
39	86295.49		170787.17	1899	197909.72	1639
38	86280.79		170673.29	1897	197811.46	1637
37	86266.08		170559.53	1895	197713.31	1635
36	86251.37		170445.87	1893	197615.27	1633
35	86236.64		170332.33	1892	197517.35	1631
34	86221.91	246	170218.90	1890	197419.54	1629
33	86207.17		170105.59	1888	197321.85	1627
32	86192.42		169992.38	1886	197224.26	1626
31	86177.68		169879.29	1885	197126.80	1624
30	86162.92		169766.31	1883	197029.44	1622

30. Grad.

	Sinus	10''.	Tangens	10''	Secans	10''
30	50753.84		58904.50		116059.21	
31	50778.90	418	58943.69	653	116079.10	332
32	50803.95		58982.89		116099.02	
33	50829.01	417	59022.11	654	116118.94	
34	50854.06		59061.34		116138.89	333
35	50879.10		59100.58		116158.85	
36	50904.14		59139.83		116178.83	
37	50929.18		59179.10	655	116198.82	
38	50954.21		59218.39		116218.83	334
39	50979.24		59257.68		116238.86	
40	51004.26		59296.99		116258.91	
41	51029.28		59336.32	656	116278.97	335
42	51054.29		59375.65		116299.05	
43	51079.30		59415.01		116319.14	
44	51104.31		59454.37		116339.25	336
45	51129.31		59493.75		116359.38	
46	51154.30		59533.14	657	116379.53	
47	51179.30	416	59572.54		116399.69	
48	51204.29		59611.96		116419.87	
49	51229.27		59651.40		116440.07	337
50	51254.25		59690.84	658	116460.28	
51	51279.22		59730.30		116480.51	
52	51304.20		59769.78		116500.76	338
53	51329.16		59809.26		116521.02	
54	51354.12		59848.76		116541.30	
55	51379.08		59888.28	659	116561.60	
56	51404.04		59927.81		116581.91	339
57	51428.99		59967.35		116602.24	
58	51453.93		60006.91		116622.59	
59	51478.87		60046.48	660	116642.96	340
60	51503.81		60086.06		116663.34	

59. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	86162.92		169766.31		197029.44	
29	86148.15	246	169653.44	1880	196932.20	1620
28	86133.37		169540.68	1879	196835.07	1618
27	86118.59		169428.04	1877	196738.05	1616
26	86103.80	247	169315.50	1875	196641.14	1614
25	86089.01		169203.08	1873	196544.34	1612
24	86074.20		169090.77	1871	196447.67	1611
23	86059.39		168978.56	1869	196351.10	1609
22	86044.57		168866.47	1867	196254.64	1607
21	86029.75		168754.49	1866	196158.29	1605
20	86014.91		168642.61	1864	196062.06	1603
19	86000.07		168530.85	1862	195965.93	1601
18	85985.23		168419.19	1860	195869.92	1599
17	85970.37	248	168307.65	1858	195774.01	1597
16	85955.51		168196.21	1856	195678.22	1596
15	85940.64		168084.89	1855	195582.54	1594
14	85925.76		167973.67	1853	195486.97	1592
13	85910.88		167862.56	1851	195391.50	1590
12	85895.99		167751.56	1849	195296.15	1588
11	85881.09		167640.67	1847	195200.91	1587
10	85868.19		167529.88	1846	195105.77	1585
9	85851.27	249	167419.21	1844	195010.75	1583
8	85836.35		167308.64	1842	194915.83	1581
7	85821.42		167198.18	1840	194821.02	1579
6	85806.49		167087.82	1838	194726.32	1578
5	85791.55		166977.58	1837	194631.73	1576
4	85776.60		166867.44	1835	194537.25	1574
3	85761.64		166757.41	1833	194442.88	1572
2	85746.68		166647.48	1831	194348.61	1570
1	85731.31		166537.66	1830	194254.45	1569
0	85716.73	250	166427.95	1828	194160.40	1567

31. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	51503.81		60086.06		116663.34	
1	51528.74	415	60125.66	660	116683.74	340
2	51553.67		60165.27		116704.15	
3	51578.59		60204.90	661	116724.59	341
4	51603.51		60244.54		116745.04	
5	51628.42		60284.19		116765.51	
6	51653.33		60323.86		116785.99	342
7	51678.24		60363.54		116806.49	
8	51703.14		60403.23	662	116827.01	
9	51728.04		60442.94		116847.55	
10	51752.93		60482.66		116868.10	343
11	51777.82		60522.40		116888.67	
12	51802.70		60562.15	663	116909.26	
13	51827.58		60601.92		116929.86	344
14	51852.45		60641.70		116950.48	
15	51877.39	414	60681.49		116971.12	
16	51902.19		60721.30	664	116991.78	
17	51927.05		60761.12		117012.45	345
18	51951.91		60800.95		117033.14	
19	51976.76		60840.80		117053.85	
20	52001.61		60880.67	665	117074.57	346
21	52026.46		60920.54		117095.31	
22	52051.30		60960.43		117116.07	
23	52076.13		61000.34		117136.85	
24	52100.96		61040.26		117157.64	347
25	52125.79		61086.19	666	117178.45	
26	52150.61		61120.14		117199.28	
27	52175.43		61160.11		117220.13	348
28	52200.24		61200.08		117240.99	
29	52225.05	413	61240.07	667	117261.87	
30	52249.86		61280.08		117282.77	

58. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	85716.73		166427.95		194160.40	
59	85701.74	250	166318.34	1826	194066.46	1565
58	85686.75		166208.84	1824	193972.62	1563
57	85671.75		166099.45	1823	193878.89	1561
56	85656.74		165990.16	1821	193785.27	1560
55	85641.73		165880.99	1819	193691.76	1558
54	85626.71		165771.89	1817	193598.35	1557
53	85611.68	251	165662.92	1815	193505.05	1554
52	85596.64		165554.05	1814	193411.85	1553
51	85581.60		165445.29	1812	193318.76	1551
50	85566.55		165336.63	1810	193225.78	1549
49	85551.49		165228.08	1809	193132.90	1547
48	85536.43		165119.63	1807	193040.13	1545
47	85521.35		165011.28	1805	192947.46	1544
46	85506.27		164903.04	1803	192854.90	1542
45	85491.19		164794.90	1802	192762.44	1541
44	85476.09	252	164686.86	1800	192670.09	1538
43	85460.99		164578.93	1798	192577.84	1537
42	85445.88		164471.11	1796	192485.70	1535
41	85430.77		164363.38	1795	192393.66	1533
40	85415.64		164255.76	1793	192301.73	1532
39	85400.51		164148.24	1791	192209.90	1530
38	85385.38		164040.82	1790	192118.17	1528
37	85370.23		163933.51	1788	192026.55	1526
36	85355.08	253	163826.30	1786	191935.03	1525
35	85339.92		163719.19	1784	191843.62	1523
34	85324.75		163612.18	1783	191752.30	1521
33	85309.58		163505.28	1781	191661.09	1519
32	85294.40		163398.47	1779	191569.99	1518
31	85279.21		163291.77	1778	191478 99	1516
30	85264.02		163185.17	1776	191388.09	1514

31. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	52249.86		61280.08		117282 77	
31	52274.66	413	61320.10	667	117303.68	349
32	52299.45		61360.13		117324.62	
33	52324.24		61400.18	668	117345.57	
34	52349.03		61440.24		117366.53	350
35	52373.81		61480.32		117387.52	
36	52398.59		61520.41		117408.52	
37	52423.36		61560.52	669	117429.54	
38	52448.13		61600.64		117450.58	351
39	52472.90		61640.77		117471.63	
40	52497.66		61680.92		117492.70	
41	52522.41		61721.08	670	117513.79	352
42	52547.16	412	61761.26		117534.90	
43	52571.91		61801.45		117556.03	
44	52596.65		61841.66		117577.17	353
45	52621.39		61881.88		117598.33	
46	52646.13		61922.11	671	117619.50	
47	52670.85		61962.36		117640.70	354
48	52695.58		62002.63		117661.91	
49	52720.30		62042.91		117683.14	
50	52745.01		62083.20	672	117704.39	
51	52769 73		62123.51		117725.66	355
52	52794.43		62163.83		117746.94	
53	52819.14		62204.17		117768.24	
54	52843.83		62244 52	673	117789.56	
55	52868.53	411	62284.85		117810.89	356
56	52893.22		62325.26		117832.25	
57	52917.90		62365.66		117853.62	
58	52942.58		62406.07	674	117875.01	357
59	52967.25		62446.59		117896.41	
60	52991.93		62486.93		117917.84	

58. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	85264.62		163185.17		191388.09	
29	85248.81	253	163078.67	1774	191297.29	1513
28	85233.60	254	162972.27	1773	191206.59	1511
27	85218.39		162865.97	1771	191116.00	1509
26	85203.16		162759.[illegible]7	1769	191025.51	1507
25	85187.93		162653.[illegible]8	1767	190935.12	1506
24	85172.69		162547.68	1766	190844.83	1504
23	85157.45		162441.78	1764	190754.64	1502
22	85142.19		162335.99	1763	190664.56	1501
21	85126.93		162230.29	1761	190574.57	1499
20	85111.67		162124.69	1759	190484.69	1497
19	85096.39	255	162019.20	1758	190394.90	1496
18	85081.11		161913.80	1756	190305.22	1494
17	85065.82		161808.50	1755	190215.64	1492
16	85050.53		161703.30	1753	190126.16	1491
15	85035.22		161598.20	1751	190036.78	1489
14	85019.91		161493.20	1749	189947.50	1487
13	85004.59		161388.29	1748	189858.32	1486
12	84989.27		161283.49	1746	189769.24	1484
11	84973.94	256	161178.78	1744	189680.26	1482
10	84958.60		161074.17	1743	189591.37	1481
9	84943.25		160969.66	1741	189502.59	1481
8	84927.90		160865.25	1740	189413.91	1477
7	84912.54		160760.94	1738	189325.32	1476
6	84897.17		160656.72	1736	189236.84	1474
5	84881.79		160552.60	1735	189148.45	1472
4	84866.4[illegible]		160448.58	1733	189060.16	1471
3	84851.02	257	160344.65	1731	188971.97	1469
2	84835.62		160240.82	1730	188883.88	1468
1	84820.22		160137.09	1728	188795.89	1466
0	84804.81		160033.45	1727	188707.99	1464

32. Grad.

	Sinus	10''	*Tangens*	10''	*Secans*	10''
0	52991.93		62486.93		117917.84	
1	53016.59	411	62527.39	674	117939.28	358
2	53041.25		62567.86	675	117960.74	
3	53065.91		62608.34		117982.22	
4	53090.56		62648.84		118003.72	
5	53115.21		62689.35		118025.23	359
6	53139.86		62729.88	676	118046.76	
7	53164.50		62770.42		118068.31	
8	53189.13		62810.98		118089.88	
9	53213.76	410	62851.55		118111.46	360
10	53238.39		62892.15	677	118133.07	
11	53263.01		62932.74		118154.69	
12	53287.63		62973.36		118176.33	361
13	53312.24		63013.99		118197.98	
14	53336.85		63054.64	678	118219.66	
15	53361.45		63095.30		118241.35	
16	53386.05		63135.98		118263.06	362
17	53410.64		63176.67		118284.79	
18	53435.23		63217.38	679	118306.54	
19	53459.82		63258.10		118328.30	363
20	53484.40		63298.83		118350.08	
21	53508.98		63339.58		118371.88	
22	53533.55	409	63380.35	680	118393.70	364
23	53558.12		63421.13		118415.54	
24	53582.68		63461.93		118437.39	
25	53607.24		63502.74		118459.27	
26	53631.79		63543.57	681	118481.16	365
27	53656.34		63584.41		118503.07	
28	53680.88		63625.27		118524.99	
29	53705.42		63666.14		118546.94	366
30	53729.96		63707.03	682	118568.90	

57. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	84804.81		160033.45		188797.99	
59	84789.39	257	159929.91	1725	188620.19	1463
58	84773.97		159826.47	1723	188532.49	1461
57	84758.53		159723.12	1722	188444.89	1459
56	84743.09		159619.87	1720	188357.38	1458
55	84727.65		159516.72	1719	188269.97	1456
54	84712.19	258	159413.66	1717	188182.66	1455
53	84696.73		159310.70	1715	188095.45	1453
52	84681.26		159207.83	1714	188008.33	1451
51	84665.79		159105.05	1712	187921.31	1450
50	84650.30		159002.38	1711	187834.38	1448
49	84634.81		158899.79	1709	187747.55	1446
48	84619.32		158797.30	1707	187660.8.	1445
47	84603.81		158694.91	1706	187574.18	:443
46	84588.30	259	158592.61	1704	187487.64	1442
45	84572.78		158490.41	1703	187401,20	1440
44	84557.26		158388.30	1701	187314.85	1438
43	84541.72		158286.28	1700	187228.55	1437
42	84526.18		158184.36	1698	187142.4[illegible]	1435
41	84510.64		158082.53	1696	187056.37	1434
40	84495.08		157980.79	1695	186970.40	1432
39	84479.52		157879.15	1693	186884.53	1431
38	84463.95	260	157777.60	1692	186798.75	1429
37	84448 37		157676.15	1690	186713.06	1427
36	84432.79		157574.79	1689	186627.4[illegible]	14[illegible]5
35	84417.20		157473.52	1687	186541.97	1424
34	84401.60		157372.34	1686	186456.57	1423
33	84386.00		157271.26	1684	186371.26	1421
32	84370.39		157170.26	1683	186286.05	1420
31	84354.77		157069.36	1681	186200.93	1418
30	84339.14		156968.56	1679	186115.90	1416

32. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	53729.96		63707.03		118568.90	
31	53754.49	409	63747.93	682	118590.89	367
32	53779.02		63788.85		118612.89	
33	53803.54		63829.78		118634.90	
34	53828.06		63870.73	683	118656.94	
35	53852.57		63911.69		118679.00	368
36	53877.08	408	63952.67		118701.07	
37	53901.58		63993.66		118723.16	
38	53926.08		64034.67	684	118745.27	369
39	53950.58		64075.69		118767.40	
40	53975.07		64116.73		118789.54	
41	53999.55		64157.79		118811.71	370
42	54024.03		64198.86	685	118833.89	
43	54048.51		64239.94		118856.09	
44	54072.98		64281.04		118878.31	
45	54097.45		64322.16		118900.55	371
46	54121.91		64363.29	686	118922.80	
47	54146.37		64404.44		118945.08	
48	54170.82		64445.60		118967.37	372
49	54195.27	407	64486.78		118989.68	
50	54219.71		64527.97	687	119012.01	
51	54244.15		64569.18		119034.36	373
52	54268.59		64610.41		119056.73	
53	54293.02		64651.65		119079.11	
54	54317.44		64692.90	688	119101.52	374
55	54341.87		64734.17		119123.94	
56	54366.28		64775.46		119146.38	
57	54390.69		64816.76		119168.84	
58	54415.10		64858.08	689	119191.32	375
59	54439.50		64899.41		119213.81	
60	54463.90		64940.76		119236.33	

57. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	84339.14		156968.56		186115.90	
29	84323.51	261	156867.84	1678	186030.96	1415
28	84307.87		156767.22	1676	185946.12	1413
27	84292.22		156666.69	1675	185861.38	1412
26	84276.57		156566.25	1673	185776.72	1410
25	84260.91		156465.90	1672	185692.16	1409
24	84245.24		156365.64	1670	185607.69	1407
23	84229.56		156265.48	1669	185523.31	1406
22	84213.88		156165.40	1667	185439.03	1404
21	84198.19	262	156065.42	1666	185354.83	1403
20	84182.49		155965.52	1664	185270.73	1401
19	84166.79		155865.72	1663	185186.72	1399
18	84151.08		155766.01	1661	185102.81	1398
17	84135.36		155666.39	1660	185018.98	1396
16	84119.63		155566.85	1658	184935.25	1395
15	84103.90		155467.41	1657	184851.61	1393
14	84088.16		155368.06	1655	184768.05	1392
13	84072.41		155268.80	1654	184684.59	1390
12	84056.66	263	155169.63	1652	184601.23	1389
11	84040.90		155070.54	1651	184517.95	1387
10	84025.13		154971.55	1649	184434.76	1386
9	84009.35		154872.64	1648	184351.66	1384
8	83993.57		154773.83	1646	184268.66	1383
7	83977.78		154675.10	1645	184185.74	1381
6	83961.99		154576.46	1643	184102.92	1380
5	83946.18		154477.92	1642	184020.18	1378
4	83930.37	264	154379.46	1640	183937.53	1377
3	83914.55		154281.08	1639	183854.98	1375
2	83898 73		154182.80	1637	183772.51	1374
1	83882.90		154084.60	1636	183690.13	1372
0	83867.06		153986.50	1635	183607.85	1371

33. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
0	54463.90		64940.76		119236.33	
1	54488.30	407	64982.12	690	119258.86	376
2	54512.69	406	65023.50		119281.41	
3	54537.07		65064.90		119303.99	
4	54561.45		65106.31		119326.58	377
5	54585.82		65147.74	691	119349.18	
6	54610.20		65189.18		119371.81	
7	54634 56		65230.64		119394.46	378
8	54658.92		65272.11		119417.12	
9	54683.28		65313.60	692	119439.80	
10	54707.63		65355.11		119462.50	379
11	54731.98		65396.63		119485.22	
12	54756.32		65438.17		119507.96	
13	54780.66		65479.72	693	119530.72	
14	54804.99		65521.29		119553.50	380
15	54829.32	405	65562.87		119576.29	
16	54853.65		65604.47		119599.11	
17	54877.97		65646 09	694	119621.94	381
18	54902.28		65687.72		119644.79	
19	54926.59		65729.37		119667.66	
20	54950.90		65771.03	695	119690.55	382
21	54975.20		65812.71		119713.46	
22	54999.49		65854.41		119736.39	
23	55023.79		65896.12		119759.34	383
24	55048.07		65937.85	696	119782.30	
25	55072.36		65979.59		119805.29	
26	55096 63		66021.35		119828 29	384
27	55120.91	404	66063.13		119851.31	
28	5 145.18		66104.92	697	119874.35	
29	55169.44		66146.73		119897.41	385
30	55193.70		66188.56		119920.49	

56. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
60	83867.06		153986.50		183607.85	
59	83851.21	264	153888.48	1633	183525.65	1369
58	83835.36		153790.54	1632	183443.54	1368
57	83819.50		153692.70	1630	183361.52	1366
56	83803.63	265	153594.94	1629	183279.58	1365
55	83787.75		153497.27	1627	183197.74	1363
54	83771.87		153399.69	1626	183115.99	1362
53	83755.98		153302.19	1624	183034.32	1360
52	83740.09		153204.79	1623	182952.74	1359
51	83724 18		153107.46	1621	182871.25	1358
50	83708.27		153010.23	1620	182789.85	1356
49	83692.36		152913.08	1619	182708.54	1355
48	83676.43		152816.02	1617	182627.31	1353
47	83660.50	266	152719.04	1616	182546.17	1352
46	83644.56		152622.15	1614	182465.12	1350
45	83628.62		152525.35	1613	182384.16	1349
44	83612.66		152428.63	1611	182303.28	1347
43	83596.70		152332.00	1600	182222.49	1346
42	83580.74		152235.45	1609	182141.79	1344
41	83564.76		152138.99	1607	182061.18	1343
40	83548.78		152042.61	1606	181980.65	1342
39	83532.79		151946.32	1604	181900.21	1340
38	83516.80	267	151850.12	1603	181819.85	1339
37	83500.80		151754.00	1601	181739.58	1337
36	83484.79		151657.96	1600	181659.40	1336
35	83468.77		151562.01	1599	181570.30	1334
34	83452.75		151466.14	1597	181499.29	1333
33	83436.72		151370.36	1596	181410.36	1331
32	83420.68		151274.66	1594	181339.53	1330
31	83404.63		151179.05	1593	181259.77	1328
30	83388.58	268	151083.52	1592	181180.10	1327

56. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	83388.58		151083.52		181180.10	
29	83372.52	268	150988.07	1591	181100.52	1326
28	83356.46		150892.71	1589	181021.02	1324
27	83340.38		150797.43	1587	180941.61	1323
26	83324.30		150702.24	1586	180862.28	1322
25	83308.22		150607.13	1585	180783.04	1320
24	83292.12		150512.10	1583	180703.88	1319
23	83276.02		150417.15	1582	180624.81	1317
22	83259.91	269	150322.29	1580	180545.82	1316
21	83243.80		150227.51	1579	180466.91	1314
20	83227.68		150132.82	1578	180388.09	1313
19	83211.55		150038.20	1576	180309.35	1312
18	83195.41		149943.67	1575	180230.70	1310
17	83179.27		149849.23	1574	180152.13	1309
16	83163.12		149754.86	1572	180073.65	1307
15	83146.96		149660.58	1571	179995.24	1306
14	83130.80		149566.37	1569	179916.93	1305
13	83114.62	270	149472.25	1568	179838.69	1303
12	83098.45		149378.22	1567	179760.54	1302
11	83082.26		149284.26	1565	179682.47	1301
10	83066.07		149190.39	1564	179604.48	1299
9	83049.87		149096.56	1563	179526.58	1298
8	83033.66		149002.88	1561	179448.76	1296
7	83017.45		148909.25	1560	179371.02	1295
6	83001.23		148815.70	1559	179293.37	1294
5	82985.00	271	148722.23	1557	179215.80	1293
4	82968.77		148628.84	1556	179138.31	1291
3	82952.52		148535.63	1555	179060.90	1290
2	82936.28		148442.31	1553	178983.57	1288
1	82920.02		148349.16	1552	178906.53	1287
0	82903.76		148256.10	1551	178829.16	1285

34. Grad.

′	Sinus	10″	Tangent.	10″	Secant.	10″
0	55919.29		67450.85		120621.79	
1	55943.40	402	67493.18	706	120645.47	395
2	55967.51		67535.53		120669.17	
3	55991.62		67577 90		120692.88	
4	56015.71		67620.28		120716.62	396
5	56039.81		67662.67	707	120740.37	
6	56063.90	401	67705.09		120764.15	
7	56087.98		67747.52		120787.94	397
8	56112.06		67789.97	708	120811.75	
9	56136.14		67832.43		120835.59	
10	56160.21		67874.92		120859.44	398
11	56184.28		67917.41		120883.31	
12	56208.34		67959.93	709	120907.20	
13	56232.39		68002.46		120931.12	399
14	56256.45		68045.01		120955.05	
15	56280.49		68087.58	710	120979.00	
16	56304.53		68130.16		121002.97	400
17	56328.57		68172.76		121026.96	
18	56352.60	400	68215.37		121050.97	
19	56376.63		68258.01	711	121075.00	401
20	56400.66		68300.66		121099.05	
21	56424.67		68343.33		121123.12	
22	56448.69		68386.01	712	121147.21	402
23	56472.70		68428.71		121171.32	
24	56496.70		68471.43		121195.45	
25	56520.70		68514.16		121219.59	403
26	56544.69		68556.92	713	121243.77	
27	56568 68		68699.69		121267.95	
28	56592.67		68642 47		121292.16	404
29	56616.65		68685.27	714	121316.39	
30	56640.62		68728.10		121340.64	

55. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	82903.76		148256.10		178829.16	
59	82887.49	271	148163.11	1549	178752.08	1284
58	82871.21		148070.21	1548	178675.08	1283
57	82854.93		147977.38	1547	178598.17	1281
56	82838.64	272	147884.63	1545	178521.33	1280
55	82822.34		147791.97	1544	178444.57	1279
54	82806.03		147699.38	1543	178367.90	1277
53	82789.72		147606.88	1541	178291.31	1276
52	82773.40		147514.45	1540	178214.79	1275
51	82757.08		147422.10	1539	178138.36	1273
50	82740.74		147329.83	1537	178062.01	1272
49	82724.40		147237.64	1536	177985.74	1271
48	82708.06		147145.53	1535	177909.55	1269
47	82691.70	273	147053.50	1533	177833.44	1268
46	82675.34		146961.55	1532	177757.41	1267
45	82658.97		146869.67	1531	177681.46	1265
44	82642.60		146777.87	1529	177605.59	1264
43	82626.22		146686.16	1528	177529.80	1263
42	82609.83		146594.52	1527	177454.09	1261
41	82593.43		146502.96	1525	177378.45	1260
40	82577.03		146411.47	1524	177302.90	1259
39	82560.62	274	146320.07	1523	177227.43	1257
38	82544.20		146228.74	1522	177152.04	1256
37	82527.78		146137.49	1520	177076.72	1255
36	82[illegible]1.35		146046.32	1519	177001.49	1253
35	82494.91		145955.22	1518	176926.33	1252
34	82478.47		145864.20	1516	176851.25	1251
33	82462.02		145773.26	1515	176776.25	1249
32	82445.56		145682.40	1514	176701.33	1248
31	82429.09		145591.61	1513	176626.49	1247
30	82412.62	275	145500.90	1511	176551.73	1245

34. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	56640.62		68728.10		121340.64	
31	56664.59	399	68770.93	714	121364.91	405
32	56688.56		68813.79		121389.20	
33	56712 52		68856.66	715	121413.51	
34	56736,48		68899.55		121437.83	406
35	56760.43		68942.46		121462.18	
36	56784.37		68985.38	716	121486.55	
37	56808.32		69028 32		121510.94	407
38	56832.25		69071.28		121535 35	
39	56856.18		69114.25		121559.78	
40	56880.11		69157.25	717	121584.23	408
41	56904.03		69200.26		121608.70	
42	56927.95		69243.28		121633.19	
43	56951.86	498	69286.33	718	121657.70	409
44	56975.77		69329.39		121682.23	
45	56999.68		69372.47		121706.78	
46	57023.57		69415.56		121731.35	410
47	57047.47		69458.68	719	121755.94	
48	57071.36		69501.81		121780.55	
49	57095.24		69544.96		121805.18	411
50	57119.12		69588.12	720	121829.83	
51	57142.99		69631.31		121854.50	
52	57166.86		69674.51		121879.19	412
53	57190.73		69717.73		121903.90	
54	57214.59		69760.97	721	121928.64	
55	57238.44		69804.22		121953.39	413
56	57262.29	397	69847.49		121978.16	
57	57286.14		69890.78	722	122302.96	
58	57309.98		69934.09		122027.77	414
59	57333.81		69977.41		122052.60	
60	57357.64		70020.75	723	122077.46	

55. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	82412.62		145500.90		176551.73	
29	82396.04	275	145410.27	1510	176477.04	1244
28	82379.65		145319.71	1509	176402.43	1243
27	82363.16		145229.23	1507	176327.91	1242
26	82346.66		145138.83	1506	176253.45	1240
25	82330.15		145048.50	1505	176179.08	1239
24	82313.64		144958.25	1504	176104.78	1238
23	82297.11		144868.08	1502	176030.56	1236
22	82280.59	276	144777.98	1501	175956.42	1235
21	82264.05		144687.96	1500	175882.36	1234
20	82247.51		144598.01	1499	175808.37	1233
19	82230.96		144508.14	1497	175734.46	1231
18	82214.40		144418.34	1496	175660.65	1230
17	82197.84		144328.62	1495	175586.87	1229
16	82181.27		144238.97	1494	175513.19	1227
15	82164.69		144149.40	1492	175439.59	1226
14	82148.11		144059.91	1491	175366.07	1225
13	82131.52	277	143970.49	1490	175292.62	1224
12	82114.92		143881.14	1489	175219.24	1222
11	82098.32		143791.87	1487	175145.95	1221
10	82081.70		143702.68	1486	175072.73	1220
9	82065.08		143613.56	1485	174999.58	1219
8	82048.46		143524.51	1484	174926.51	1217
7	82031.83		143435.54	1482	174853.52	1216
6	82015.19		143346.64	1491	174780.60	1215
5	81998.54		143257.81	1480	174707.76	1213
4	81981.89	278	143169.06	1479	174634.99	1212
3	81965.23		143080.39	1477	174562.30	1211
2	81948.56		142991.78	1476	174489.69	1210
1	81931.89		142903.26	1475	174417.14	1208
0	81915.20		142814.80	1474	174344.68	1207

35. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	57357.64		70020.75		122077.46	
1	57381.47	397	70064.11	723	122102.33	415
2	57405.29		70107.49		122127.23	
3	57429.11		70150.89		122152.15	
4	57452.92		70194.30	724	122177.03	416
5	57476.72		70237.73		122202.04	
6	57500.52		70281.18		122227.02	
7	57524.32		70324.64	725	122252.02	417
8	57548.11	396	70368.13		122277.03	
9	57571.90		70411.63		122302.07	418
10	57595.68		70455.15		122327.13	
11	57619.46		70498.68	726	122352.21	
12	57643.23		70542.24		122377.32	419
13	57667.00		70585.81		122402.44	
14	57690.76		70629.40	727	122427.58	
15	57714.52		70673.01		122452.74	420
16	57738.27		70716.64		122477.93	
17	57762.02		70760.28	728	122503.13	
18	57785.76		70807.95		122528.36	421
19	57809.50		70847.63		122553.61	
20	57833.23	395	70891.33		122578.87	
21	57856.96		70935.04	729	122604.16	422
22	57880.68		70978.78		122629.47	
23	57904.40		71022.53		122654.80	
24	57928.12		71066.30	730	122680.15	423
25	57951.83		71110.09		122705.52	
26	57975.53		71153.90		122730.91	
27	57999.23		71197.72	731	122756.33	424
28	58022.92		71241.56		122781.76	
29	58046.61		71285.43		122807 21	
30	58070.29		71329.31		122832.69	425

54. Grad.

[illegible]	Sinus	10"	Tangens	10"	Secans	10"
60	81915.20		142814.80		174344.66	
59	81898.52	278	142736.42	1473	174272.29	1206
58	81881.82		142638.11	1472	174199.97	1205
57	81865.12		142549.87	1471	174127.73	1203
56	81848.41	279	142461.71	1469	174055.56	1202
55	81831.69		142373.62	1468	173983.47	1201
54	81814.97		142285.61	1466	173911.45	1200
53	81798.24		142197.66	1465	173839.51	1199
52	81781.50		142109.79	1464	173767.64	1197
51	81764.76		142022.00	1463	173695.85	1196
50	81748.01		141934.27	1462	173624.[illegible]3	1195
49	81731.25		141846.62	1460	173552.48	1194
48	81714.49		141759.04	1459	173480.90	1192
47	81697.72	280	141671.53	1458	173409.40	1191
46	81680.94		141584.09	1456	173337.98	1190
45	81664.15		141496.73	1456	173266.63	1189
44	81647.36		141409.43	1454	173195.35	1187
43	81630.56		141322.21	1453	173124.14	1186
42	81[illegible]3.76		141235.06	1452	173053.01	1185
41	81596.95		141147.99	1451	172981.95	1184
40	81580.13		141060.98	1450	172910.96	1183
39	81563.30		140974.05	1448	172840.05	1181
38	81546.47	281	140887.18	1447	172769.21	1180
37	81529.63		140800.39	1446	172698.44	1179
36	81512.78		140713.67	1445	172627.74	1178
35	81495.92		140627.02	1444	172557.12	1177
34	81479.06		140540.44	1442	172486.57	1175
33	81462.20		140453.93	1441	172416.09	1174
32	81445.32		140367.49	1440	172345.68	1173
31	81428.44		140281.13	1439	172275.34	1172
30	81411.55	282	140194.83	1438	172205.08	1171

35. Grad.

	Sinus	10''	Tangens	10''	Secans	10''
30	58070.29		71329.31		122832.69	
31	58093.97	395	71373.20	732	122858.19	425
32	58117.65		71417.12		122883.71	
33	58141.32	394	71461.05		122909.24	426
34	58164.98		71505.01	733	122934.80	
35	58188.64		71548.98		122960.38	427
36	58212.30		71592.97		122985.99	
37	58235.95		71636.98	734	123011.61	
38	58259.59		71681.00		123037.25	428
39	58283.23		71725.05		123062.92	
40	58306.87		71769.11	735	123088.61	
41	58330.50		71813.19		123114.32	429
42	58354.12		71857.29		123140.04	
43	58377.74		71901.41		123165.79	
44	58401.36		71945.54	736	123191.56	430
45	58424.97	393	71989.70		123217.36	
46	58448.57		72033.87		123243.17	
47	58472.17		72078.06	737	123269.00	431
48	58495.77		72122.27		123294.86	
49	58519.36		72166.50		123320.74	
50	58542.94		72210.75	738	123346.64	432
51	58566.52		72255.02		123372.56	
52	58590.10		72299.30		123398.50	433
53	58613.67		72343.61	739	123424.46	
54	58637.24		72387.93		123450.44	
55	58660.80		72432.27		123476.45	434
56	58684.35		72476.63		123502.48	
57	58707.90	392	72521.01	340	123528.52	
58	58731.45		72565.40		123554.59	435
59	58754.99		72609.82		123580.68	
60	58778.52		72654.25	741	123606.80	

54. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	81411.55		140194.83		172205.08	
29	81394.66	282	140108.60	1437	172134.89	1169
28	81377.75		140022.45	1436	172064.77	1168
27	81360.84		139936.36	1434	171994.72	1167
26	81343.93		139850.34	1433	171924.75	1166
25	81327.01		139764.40	1432	171854.84	1165
24	81310.08		139678.52	1431	171785.01	1163
23	81293.14		139592.71	1430	171715.25	1162
22	81276.20		139506.98	1428	171645.56	1161
21	81259.24	283	139421.35	1427	171575.94	1160
20	81242.29		139335.71	1426	171506.39	1159
19	81225.32		139250.18	1425	171436.91	1157
18	81208.35		139164.73	1424	171367.50	1156
17	81191.37		139079.34	1423	171298.17	1155
16	81174.39		138994.01	1422	171228.90	1154
15	81157.40		138908.76	1420	171159.70	1153
14	81140.40		138823.58	1419	171090.58	1152
13	81123.39		138738.46	1418	171021.52	1150
12	81106.38	284	138653.42	1417	170952.54	1149
11	81089.36		138568.44	1416	170883.62	1148
10	81072.34		138483.53	1415	170814.78	1147
9	81055.30		138398.69	1414	170736.00	1146
8	81038.26		138313.92	1412	170677.30	1145
7	81021.22		138229 22	1411	170608.66	1144
6	81004.16		138144.58	1410	170540.10	1142
5	80987.10		138060.01	1409	170471.60	1141
4	80970.04		137975.51	1408	170403.18	1140
3	80952.96	285	137891.08	1407	170334.82	1139
2	80935.88		137806.72	1406	170266.53	1138
1	80918.79		137722.42	1404	170198.31	1137
0	80901.70		137638.19	1403	170130.16	1135

36. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	58778.52		72654.25		123606.80	
1	58802.06	392	72698.71	741	123632.93	436
2	58825.58		72743.18		123659.09	
3	58849.10		72787.67	742	123685.26	
4	58872.62		72832.18		123711.46	437
5	58896.13		72876.71		123737.68	
6	58919.64		72921.25	743	123763.93	
7	58943.14		72965.82		123790.19	438
8	58966.63		73010.41		123816.47	
9	58990.12	391	73055.01	744	123842.78	439
10	59013.61		73099.63		123869.11	
11	59037.09		73144.27		123895.46	
12	59060.57		73188.94	745	123921.8,	440
13	59084.04		73233.62		123948.22	
14	59107.50		73278.31		123974.64	
15	59130.96		73323.03		124001.08	441
16	59154.42		73367.77	746	124027.54	
17	59177.87		73412.53		124054.02	
18	59201.32		73457.30		124080.52	442
19	59224.76		73502.10	747	124107.04	
20	59248.19		73546.91		124133.59	
21	59271.63	390	73591.74		124160.16	443
22	59295.05		73636.60	748	124186.75	
23	59318.47		73681.47		124213.36	
24	59341.89		73726.36		124239.99	444
25	59365.30		73771.27	749	124266.65	
26	59388.70		73816.20		124293.33	445
27	59412.11		73861.15		124320.03	
28	59435.50		73906.11	750	124346.75	446
29	59458.89		73951.18		124373.49	
30	59482.28		73996.11		124400.26	

53. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	80901.70		137638.19		170130.16	
59	80884.60	285	137554.03	1402	170062.08	1134
58	80867.49		137469.94	1401	169994.07	1133
57	80850.17		137385.91	1400	169926.12	1132
56	80833.25		137301.95	1399	169858.25	1131
55	80816.12	286	137218.05	1398	169790.44	1130
54	80798.99		137134.23	1397	169722.71	1128
53	80781.85		137050.47	1396	169655.04	1127
52	80764.70		136966.78	1394	169587.43	1126
51	80747.54		136883.15	1393	169519.90	1125
50	80730.38		136799.59	1392	169452.44	1124
49	80713.21		136716.10	1391	169385.04	1123
48	80696.03		136632.67	1390	169317.71	1122
47	80678.85		136549.31	1389	169250.45	1121
46	80661.66	287	136466.02	1388	169183.26	1119
45	80644.46		136382.79	1387	169116.13	1118
44	80627.26		136299.63	1386	169049.07	1117
43	80610.05		136216.53	1384	168982.08	1116
42	80592.83		136133.50	1383	168915.16	1115
41	80575.60		136050.54	1382	168848.30	1114
40	80558.37		135967.64	1381	168781.51	1113
39	80541.13		135884.81	1380	168714.79	1112
38	80523.89		135802.04	1379	168648.14	1110
37	80506.64	288	135719.34	1378	168581.55	1109
36	80489.38		135636.70	1377	168515.03	1108
35	80472.11		135554.13	1376	168448.57	1107
34	80454.84		135471.62	1375	168382.18	1106
33	80437.56		135389.18	1374	168315.76	1105
32	80420.28		135306.80	1372	168249.61	1104
31	80402.98		135224.49	1371	168183.42	1103
30	80385.69		135142.24	1370	168117.30	1102

36. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	59482.28		73996.11		124400.26	
31	59505.66	390	74041.13	751	124427.04	447
32	59529.03		74086.18		124453.85	
33	59552.41	389	74131.24		124480.69	
34	59575.77		74276.33	752	124507.54	448
35	59599.13		74221.43		124534.42	
36	59622.46		74266.55		124561.31	449
37	59645.84		74311.70	753	124588.23	
38	59659.18		74356.86		124615.18	
39	56692.52		74402.04		124642.14	450
40	59715.86		74447.24	754	124669.13	
41	59739.19		74492.46		124696.14	
42	59762.51		74537.70		124723.14	451
43	59785.83		74582.96	755	124750.22	
44	59809.15		74628.24		124777.30	
45	59832.46	388	74673.54		124804.40	452
46	59855.76		74718.86		124831.52	
47	59879.06		74764.20	756	124858.66	453
48	59902.36		74809.56		124885.83	
49	59925.65		74854.94		124913.01	
50	59948.93		74900.33	757	124940.23	454
51	59972.21		74945.75		124967.46	
52	59995.49		74991.19		124994.71	
53	60018.76		75036.65	758	125021.99	455
54	60042.02		75082.12		125049.29	
55	60065.28		75127.62		125076.61	456
56	60088.54		75173.14	759	125103.96	
57	60111.73	387	75218.67		125131.33	
58	60135.03		75264.23		125158.72	457
59	60158.27		75309.81	760	125186.13	
60	60181.50		75355.40		125213.57	

53. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	80385.69		135142.24		168117.30	
29	80368.38	288	135060.06	1369	168051.24	1100
28	80351.07	289	134977.94	1368	167985.25	1099
27	80333.75		134895.89	1367	167919.33	1098
26	80316.42		134813.90	1366	167853.47	1097
25	80299.09		134731.97	1365	167787.68	1096
24	80281.75		134650.11	1364	167721.95	1095
23	80264.40		134568.32	1363	167656.29	1094
22	80247.05		134486.58	1362	167590.70	1093
21	80229.69		134404.92	1361	167525.17	1092
20	80212.32		134323.31	1360	167459.70	1091
19	80194.94	290	134241.77	1359	167394.30	1090
18	80177.56		134160.29	1358	167328.97	1088
17	80160.18		134078.88	1356	167263.70	1087
16	80142.78		133997.53	1355	167198.50	1086
15	80125.38		133916.24	1354	167133.36	1085
14	80107.97		133835.02	1353	167068.28	1084
13	80090.56		133753.86	1352	167003.28	1083
12	80073.14		133672.76	1351	166938.33	1082
11	80055.71	291	133591.72	1350	166873.45	1081
10	80038 27		133510.75	1349	166808.64	1080
9	80020.83		133429.84	1348	166743.89	1079
8	80003.38		133349.00	1347	166679.20	1078
7	79985.93		133268.22	1346	166614.58	1077
6	79968.47		133187.49	1345	166550.02	1076
5	79951.00		133106.84	1344	166485.52	1074
4	79933.52		133026.24	1343	166421.09	1073
3	79916.04		123945.71	1342	166356.73	1072
2	79898.55	292	132865.24	1341	166292.43	1071
1	79881.05		132784.83	1340	166228.19	1070
0	79863.55		132704.48	1339	166164.01	1069

37. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
0	60181.50		75355.40		125213.57	
1	60204.73	387	75401.02	760	125241.02	458
2	60227.95		75446.66	761	125268.50	
3	60251.17		75492.31		125296.01	459
4	60274.39		75537.99		125323.53	
5	60297.59		75583.69	762	125351.08	
6	60320.80		75629.41		125378.65	460
7	60344.00		75675.14		125406.25	
8	60367.19	386	75720.90	763	125433.87	
9	60390.38		75766.68		125461.51	461
10	60413.56		75812.47		125489.17	
11	60436.74		75858.29	764	125516.85	462
12	60459.91		75904.13		125544.56	
13	60483.08		75949.99		125572.29	
14	60506.24		75995.87	765	125600.05	463
15	60529.40		76041.77		125627.82	
16	60552.55		76087.69		125655.62	464
17	60575.70		76133.63	766	125683.45	
18	60598.84		76179.58		125711.29	
19	60621.98		76225.57	767	125739.16	465
20	60645.11	385	76271.57		125767.05	
21	60668.23		76317.59		125794.97	
22	60691.36		76363.63	768	125822.91	466
23	60714.47		76409.69		125850.87	
24	60737.58		76455.77		125878.85	467
25	60760.69		76501.88	769	125906.86	
26	60783.79		76548.00		125934.89	
27	60806.89		76594.14		125962.94	468
28	60829.98		76640.31	770	125991.02	
29	60853.06		76686.49		126019.12	469
30	60876.14		76732.70		126047.24	

52. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	79863.55		132704.48		166164.01	
59	79846.04	292	132624.20	1338	166099.90	1068
58	79828.52		132543.97	1337	166035.85	1067
57	79811.00		132463.81	1336	165971.87	1066
56	79793.47		132383.71	1335	165907.95	1065
55	79775.94		132303.68	1334	165844.09	1064
54	79758.39		132223.70	1332	165780.30	1063
53	79740.84	293	132143.79	1331	165716.57	1062
52	79723.29		132063.93	1330	165652.90	1061
51	79705.72		131984.14	1329	165589.29	1060
50	79688.15		131904.41	1328	165525.71	1059
49	79670.57		131824.74	1327	165462.27	1058
48	79652.99		131745.13	1326	165398.85	1056
47	79635.40		131665.59	1325	165335.50	1055
46	79617.80		131586.10	1324	165272.21	1054
45	79600.20		131506.68	1323	165208.98	1053
44	79582.59	294	131427.31	1322	165145.81	1052
43	79564.97		131348.01	1321	165082.7[illegible]	1051
42	79547.3[illegible]		131268.76	1320	165019.66	1050
41	79529.72		131189.58	1319	164956.68	1049
40	79512.08		131110.46	1318	164893.76	1048
39	79494.43		131031.39	1317	164830.90	1047
38	79476.78		130952.40	1316	164768.11	1046
37	79459.13		130873.45	1315	164705.37	1045
36	79441.46		130794.57	1314	164642.70	1044
35	79423.79	295	130715.75	1313	164580.09	1043
34	79406.11		130636.99	1312	164517.54	1042
33	79388.43		130558.28	1311	164455.06	1041
32	79370.74		130479.64	1310	164392.63	1040
31	793[illegible]3.04		130401.06	1309	164330.27	1039
30	79335.33		130322.54	1308	164267.96	1038

37. Grad.

	Sinus	10″	Tangens	10″	Secans	10′
30	60876.14		76732.70		126047.24	
31	60899.22	385	76778.92	771	126075.39	469
32	60922.29	384	76825.17		126103.56	470
33	60945.35		76871.44		126131.75	
34	60968.41		76917.73	772	126159.97	
35	60991.47		76964.04		126188.20	471
36	61014.52		77010.37		126216.47	
37	61037.56		77056.72	773	126244.75	472
38	61060.60		77103.09		126273.06	
39	61083.63		77149.48		126301.39	
40	61106.66		77195.89	774	126329.75	473
41	61129.69		77242.33		126358.13	
42	61152.70		77288.78		126386.53	474
43	61175.72	383	77335.26	775	126414.96	
44	61198.72		77381.75		126443.41	
45	61221.73		77428.27		126471.88	475
46	61244.73		77474.81	776	126500.38	
47	61267.72		77521.37		126528.90	476
48	61290.70		77567.95	777	126557.45	
49	61313.69		77614.55		126586.01	
50	61336.66		77661.17		126614.60	477
51	61359.64		77707.82	778	126643.22	
52	61382.60		77754.48		126671.86	478
53	61405.56		77801.17		126700.52	
54	61428.52		77847.88	779	126729.21	
55	61451.47	382	77894.60		126757.92	479
56	61474.42		77941.35		126786.65	
57	61497.36		77988.12	780	126815.41	480
58	61520.29		78034.91		126844.19	
59	61543.22		78081.73		126872.99	
60	61566.15		78128.56	781	126901.82	481

52. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	79335.33		130322.54		164267.96	
29	79317.62	295	130244.07	1307	164205.72	1037
28	79299.90		130165.67	1306	164143.54	1036
27	79282.18		130087.32	1305	164081.42	1035
26	79264.45	296	130009.04	1304	164019.36	1034
25	79246.91		129930.81	1303	163957.36	1033
24	79228.96		129852.65	1302	163895.42	1032
23	79211.21		129774.54	1301	163833.55	1031
22	79193.45		129696.49	1300	163771.73	1030
21	79175.69		129618.50	1299	163709.97	1029
20	79157.92		129540.57	1298	163648.28	1028
19	79140.14		129462.69	1297	163586.64	1027
18	79122.35		129384.88	1296	163525.07	1026
17	79104.56	297	129307.12	1295	163463.55	1025
16	79086.76		129229.34	1294	163402.10	1024
15	79068.96		129151.79	1294	163340.70	1023
14	79051.14		129074.21	1293	163279.37	1022
13	79033.33		128996.69	1292	163218.09	1021
12	79015.50		128919.22	1291	163156.88	1020
11	78996.67		128841.82	1290	163095.72	1019
10	78979.33		128764.47	1289	163034.62	1018
9	78961.98		128687.18	1288	162973.59	1017
8	78944.13	298	128609.95	1287	162612.61	1016
7	78926.27		128532.77	1286	162851.69	1015
6	78908.41		128455.66	1285	162790.83	1014
5	78890.54		128378.60	1284	162730.03	1013
4	78872.66		128301.60	1283	162669.29	1012
3	78854.77		128224.66	1282	162608.61	1011
2	78835.88		128147.76	1281	162547.99	1010
1	78818.98		128070.93	1280	162487.43	1009
0	78801.07		127994.16	1279	162426.92	1008

38. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	61566.15		78128.56		126901.82	
1	61589.07	382	78175.42	781	126930.67	481
2	61611.93		78222.29		126959.55	
3	61634.89		78269.19	782	126988.45	482
4	61657.79		78316.11		127017.37	
5	61680.69		78363.05	783	127046.32	483
6	61703.59		78410.02		127075.29	
7	61726.48	381	78457.00		127104.29	
8	61749.36		78504.00	784	127133.31	484
9	61772.24		78551.03		127162.35	
10	61795.11		78598.08		127191.42	485
11	61817.98		78645.15	785	127220.51	
12	61840.84		78692.24		127249.63	
13	61863.70		78739.35		127278.77	486
14	61886.55		78786.49	786	127307.94	
15	61909.39		78833.64		127337.12	487
16	61932.24		78880.82		127366.34	
17	61955.07		78928.02	787	127395.57	488
18	61977.9[illegible]	380	78975.24		127424.84	
19	62000.73		79022.48	788	127454.12	
20	62023.55		79069.75		127483.43	489
21	62046.36		79117.03		127512.76	
22	62069.17		79164.34	789	127542.12	490
23	62091.98		79211.67		127571.50	
24	62114.78		792[illegible]9.02		127600.91	
25	62137.57		79306.40	790	127630.34	491
26	62160.36		79353.79		127659.80	
27	62183.14		79401.21		127689.28	492
28	62205.9[illegible]		79448.65	791	127718.78	
29	62228.70	379	79496.11		127748.31	
30	62251.46		79543.59	792	127777.87	493

51. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	78801.07		127994.16		162426.92	
59	78783.16	299	127917.45	1278	162366.48	1007
58	78765.24		127840.79	1277	162306.09	1006
57	78747.32		127764.19	1276	162245.76	1005
56	78729.39		127687.64	1275	162185.49	1004
55	78711.45		127611.16	1274	162125.28	1003
54	78693.50		127534.73	1273	162065.13	1002
53	78675.55		127458.36	1272	162005.04	1001
52	78657.59		127382.04	1271	161945.00	1000
51	78639.63		127305.78	1270	161885.02	999
50	78621.65	300	127229.57	1269	161825.10	998
49	78603.67		127153.41	1269	161765.24	997
48	78585.69		127077.33	1268	161705.44	996
47	78567.70		127001.30	1267	161645.69	995
46	78549.70		126925.32	1266	161586.00	994
45	78531.69		126849.39	1265	161526.37	993
44	78513.68		126773.53	1264	161466.80	992
43	78495.66		126697.72	1263	161407.28	992
42	78477.64		126621.96	1262	161347.83	990
41	78459.61	301	126546.26	1261	161288.43	990
40	78441.57		126470.62	1260	161229.08	986
39	78423.52		126395.03	1259	161169.80	988
38	78405.47		126319.50	1258	161110.57	986
37	78387.41		126244.02	1258	161051.40	986
36	78369.35		126168.60	1257	160992.28	985
35	78351.27		126093.23	1256	160933.23	984
34	78333.19		126017.92	1255	160874.23	983
33	78315.11		125942.67	1254	160815.28	982
32	78297.02	302	125867.47	1253	160756.40	981
31	78278.92		125792.32	1252	160697.57	980
30	78260.82		125717.23	1251	160638.79	979

38. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	62251.46		79543.59		127777.87	
31	62274.23	379	79591.10	792	127807.44	494
32	62296.98		79638.62		127837.05	
33	62319.73		79686.17	793	127866.67	
34	62342.48		79733.74		127896.32	495
35	62365.22		79781.34		127926.00	
36	62387.96		79828.95	794	127955.70	
37	62410.69		79876.59		127985.43	496
38	62433.42		79924.25	795	128015.18	
39	62456.14		79971.93		128044.95	
40	62478.85		80019.63		128074.75	497
41	62501.56	378	80067.36	796	128104.57	
42	62524.27		80115.11		128134.42	498
43	62546.96		80162.88		128162.30	
44	62569.66		80210.67	797	128194.19	499
45	62592.35		80258.48		128224.12	
46	62615.03		80306.32		128254.07	
47	62637.71		80354.18	798	128284.04	500
48	62660.38		80402.06		128314.04	
49	62683.05		80449.97	799	128344.06	501
50	62705.71		80497.90		128374.11	
51	62728.37		80545.84		128404.18	
52	62751.02	377	80593.82	800	128434.28	502
53	62773.66		80641.81		128464.40	
54	62796.31		80689.83		128494.55	503
55	62818.94		80737.87	801	128524.72	
56	62841.57		80785.93	802	128554.92	504
57	62864.20		80834.01		128585.14	
58	62886.82		80882.12		128615.39	
59	62909.45		80930.25		128645.66	505
60	62932.04		80978.40	803	128675.96	

51. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	78260.82		125717.23		160638.79	
29	78242.70	302	125642.19	1250	160580.08	978
28	78224 59		125567.21	1249	160521.42	977
27	78206.46		125492.29	1248	160462.81	676
26	78188.33		125417.42	1247	160404.26	975
25	78170.19		125342.60	1246	160345.77	974
24	78152.05		125267.84	1245	160287.34	974
23	78133.90	303	125193.13	1244	160228.96	973
22	78115.74		125118.47	1243	160170.64	972
21	78077.57		125043.88	1242	160112.37	971
20	78079.40		124969.33	1242	160054.16	970
19	78061.22		124894.84	1241	159996.00	969
18	78043.04		124820.40	1240	159937.90	968
17	78024.85		124746.02	1239	159879.86	967
16	78006.65		124671.69	1238	159821.87	966
15	77988.45		124597.42	1237	159763.94	965
14	77970.24	304	124523.20	1237	159706.06	964
13	77952.02		124449.03	1236	159648.24	963
12	77933.80		124374.92	1235	159590.47	962
11	77915.57		124300.86	1234	159532 76	961
10	77897.33		124226.85	1233	159475.11	961
9	77879.08		124152 90	1232	159417.51	960
8	77860.83		124079.00	1231	159359.96	959
7	77842.58		124005.15	1230	159302.47	958
6	77824.31		123931.36	1229	159245.04	957
5	77806.04	305	123857.62	1229	159187.66	956
4	77787.77		123783.93	1228	159130.33	955
3	77769.48		123710.30	1227	159073.06	954
2	77751.19		123636.72	1226	159015 84	953
1	77732.90		123563.19	1225	158958 68	952
0	77714.60		123489.72	1224	158901.57	951

39. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
0	62932.04		80978.40		128675.96	
1	62954.64	377	81026.58	803	128706.28	506
2	62977.24		81074.78		128736.63	
3	62999.83	376	81123.00	804	128767.00	
4	63022.42		81171.24		128797.40	507
5	63045.00		81219.51	805	128827.82	
6	63067.58		81267.79		128858.27	508
7	63090.15		81316.11		128888.75	
8	63112.72		81364.44	806	128919.25	509
9	63135.28		81412.80		128949.77	
10	63157.83		81461.18	807	128980.32	
11	63180.38		81509.58		129010.90	510
12	63202.93		81558.01		129041.50	
13	63225.47		81606.46	808	129072.13	511
14	63248.00		81654.93		129102.78	
15	63270.53	375	81703.43		129133.46	512
16	63293.06		81751.94	809	129164.16	
17	63315.57		81800.49		129194.89	
18	63338.09		81849.05	810	129225.64	513
19	63360.59		81897.64		129256.42	
20	63383.10		81946.25		129287.23	514
21	63405.59		81994.88	811	129318.06	
22	63428.08		82043.54	812	129348.92	515
23	63450.57		82092.22		129379.80	
24	63473.05		82140.93		129410.71	
25	63495.53		82189.65		129441.64	516
26	63518.00	374	82238.40	813	129472.60	
27	63540.46		82287.18		129503.59	517
28	63562.92		82335.97		129534.60	
29	63585.37		82384.79	814	129565.64	518
30	63607.82		82433.64		129596.70	

50. Grad.

	Sinus	10″	Tangens.	10	Secans.	10″
60	77714.60		123489.72		158901.57	
59	77696.29	305	123416.29	1223	158844.52	950
58	77677.97		123342.92	1222	158787.52	950
57	77659.65		123269.61	1222	158730.58	949
56	77641.32	306	123196.34	1221	158673.69	948
55	77622.98		123123.13	1220	158616.85	947
54	77604.64		123049.97	1219	158560.07	946
53	77586.29		122976.86	1218	158503.34	945
52	77567.94		122903.81	1217	158446.67	944
51	77549.57		122830.81	1216	158390.05	943
50	77531.21		122757.86	1215	158333.48	942
49	77512.83		122684.96	1215	158276.97	941
48	77494.45		122612.11	1214	158220.51	941
47	77476.06	307	122539.32	1213	158164.11	940
46	77457.67		122466.58	1212	158107.76	939
45	77439.26		122393.89	1211	158051.46	938
44	77420.86		122221.25	1210	157995.21	937
43	77402.44		122248.66	1209	157939.02	936
42	77384.02		122176.12	1208	157882.89	935
41	77365.59		122103 64	1207	157826.80	934
40	77347.16		122031.21	1206	157770.77	933
39	77328.72		121958.83	1206	157714.79	933
38	77310.27		121886.50	1205	157658.87	932
37	77291.82	308	121814.22	1204	157602.99	931
36	77273.36		121741.99	1203	157547.18	930
35	77254.89		121669.82	1203	157491.41	929
34	77236.42		121597.69	1202	157435.70	928
33	77217.94		121525.62	1201	157380.04	927
32	77199.45		121453.59	1200	157324.43	926
31	77180.96		121381.62	1199	157268.87	926
30	77162.46		121309.70	1198	157213.37	925

50. Grad.

	Sinus	10″	*Tangens*	10″	*Secant*	10″
30	77162.46		121309.70		157213.37	
29	77143.95	308	121237.83	1197	157157.92	924
28	77125.44	309	121166.81	1197	157102.52	923
27	77106.92		121094.24	1196	157047.17	922
26	77088.39		121022.52	1195	156991.88	921
25	77069.86		120950.85	1194	156936.64	920
24	77051.32		120879.23	1193	156881.45	919
23	77032.78		120807.67	1192	156826.31	919
22	77014.23		120736.15	1192	156771.23	918
21	76995.67		120664.68	1191	156716.19	917
20	76977.10		120593.27	1190	156661.21	916
19	76958.53	319	120521.90	1189	156606.28	915
18	76939.95		120450.58	1188	156551.41	914
17	76921.37		120379.31	1187	156496.58	913
16	76902.78		120308.10	1187	156441.81	913
15	76884.18		120236.93	1186	156387.08	912
14	76865.58		120165.81	1185	156332.41	911
13	76846.97		120094.75	1184	156277.79	911
12	76828.35		120023.73	1183	156223.22	909
11	76809.73		119952.76	1182	156168.70	908
10	76791.10	311	119881.84	1182	156114.24	907
9	76772.46		119810.97	1181	156059.82	907
8	76753.82		119740.15	1180	156005.46	906
7	76735.17		119669.38	1179	155951.15	905
6	76716.51		119598.66	1178	155896.89	904
5	76697.85		119527.99	1178	155842.67	903
4	76679.18		119457.36	1177	155788.51	902
3	76660.51		119386.79	1176	155734.41	901
2	76641.83		119316.26	1175	155680.35	901
1	76623.14	312	119245.79	1174	155626 34	900
0	76604.44		119175.36	1173	155572.38	899

40. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	64278.76		83909.96		130540.73	
1	64301.04	371	83959.54	827	130572.60	532
2	64323.32		84009.15		130604.51	
3	64345.59		84058.78		130636.44	
4	64367.85		84108.44	828	130668.39	533
5	64390.11		84158.12		130700.38	
6	64412.36		84207.82	829	130732.39	534
7	64434.61		84257.55		130764.42	
8	64456.85		84307.30		130796.49	535
9	64479.09		84357.08	830	130828.58	
10	64501.32	370	84406.88		130860.69	536
11	64523.55		84456.70	831	130892.84	
12	64545.77		84506.55		130925.01	537
13	64567.98		84556.43		130957.20	
14	64590.19		84606 32	832	130989.43	
15	64612.40		84656 25		131021.68	538
16	64634.60		84706.20	833	131053.96	
17	64656.79		84756.17		131086.26	539
18	64678.98		84806.17	834	131118.59	
19	64701.16		84856.19		131150.95	540
20	64723.34		84906.24		131183.34	
21	64745.51	369	84956.31	835	131215.75	
22	64767.67		85006.40		131[illegible]48.19	541
23	64789.83		85056.52	836	131280.66	
24	64811.99		85106.67		131313.16	542
25	64834.14		85156.84		131345.68	
26	64856.28		85207.04	837	131378.23	543
27	64878.42		85257 26		131410.81	
28	64900.55		85307.50	838	131443.41	544
29	64922.68		85357.77		131476.04	
30	64944.80		85408.07		131508.70	545

49. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
60	76604.44		119175.36		155572.38	
59	76585.74	312	119104.98	1173	155518.48	898
58	76567.03		119034.65	1172	155464.62	897
57	76548.32		118964.37	1171	155410.81	896
56	76529.60		118894.14	1170	155357.06	895
55	76510.87		118823.95	1169	155303.35	895
54	76492.14		118753.82	1169	155249.70	894
53	76473.40		118683.73	1168	155196.89	893
52	76454.65		118613.69	1167	155142.54	892
51	76435.90	313	118543.70	1166	155089.04	891
50	76417.14		118473.76	1165	155035.58	891
49	76398.37		118403.87	1165	154982.18	890
48	76379.60		118334.02	1164	154928.82	889
47	76360.82		118264.22	1163	154875.52	888
46	76342.04		118194.47	1162	154822.26	887
45	76323.25		118124.77	1161	154764.06	886
44	76304.45		118055.12	1161	154715.90	886
43	76285.64		117985.51	1160	154662.80	885
42	76266.83	314	117915.95	1159	154609.74	884
41	76248.01		117846.44	1158	154556.73	883
40	76229.19		117776.98	1157	154503.78	882
39	76210.36		117707.56	1157	154450.87	881
38	76191.52		117638.20	1156	154398.01	881
37	76172.68		117568.88	1155	154345.20	880
36	76153.83		117499.60	1154	154292.44	879
35	76134.97		117430.38	1153	154239.73	878
34	76116.11		117361.20	1153	154187.06	877
33	76097.24	315	117292.07	1152	154134.45	877
32	76078.37		117222.98	1151	154081.89	876
31	76059.48		117153.95	1150	154029.37	875
30	76040.60		117084.96	1149	153976.90	874

40. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	64944.80		85408.07		131508.70	
31	64966.92	369	85458.39	839	131541.39	545
32	64988.03	368	85508.73		131574.10	
33	65011.14		85559.10	840	131606.84	546
34	65033.24		85609.50		131639.61	
35	65055.33		85659.92	841	131672.40	547
36	65077.42		85710.37		131705.23	
37	65099.50		85760.84		131738.08	548
38	65121.58		85811.33	842	131770.96	
39	65143.66		85861.85		131803.86	549
40	65165.72		85912.40	843	131836.79	
41	65187.78		85962.97		131869.76	550
42	65209.84		86013.57	844	131902.74	
43	65231.89	367	86064.19		131935.76	551
44	65253.94		86114.84		131968.80	
45	65275.97		86165.51	845	132001.88	
46	65298.01		86216.21		132034.98	552
47	65320.04		86266.93	846	132068.10	
48	65342.06		86317.68		132101.26	553
49	65364.08		86368.46		132134.44	
50	65386.09		86419.26	847	132167.65	554
51	65408.10		86470.09		132200.89	
52	65430.10		86520.94	848	132234.16	555
53	65452.09		86571.81		132267.45	
54	65474.08	366	86622.72	849	132300.77	556
55	65496.06		86673.65		132334.13	
56	65518.04		86724.60		132367.50	557
57	65540.02		86775.58	850	132391.91	
58	65561.98		86826.58		132434.35	558
59	65583.95		86877.62	851	132467.81	
60	65605.90		86928.67		132501.30	

49. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	76040.60		117084.96		153976.90	
29	76021.79	315	117016.01	1149	153924.49	873
28	76002.80		116947.12	1148	153872.12	872
27	75983.89		116878 27	1147	153819.80	872
26	75964.98		116809.47	1146	153767.52	871
25	75946.06		116740.71	1146	153715.30	870
24	75927.13		116672.00	1145	153663.12	869
23	75908.20	316	116603.34	1144	153611.00	868
22	75889.26		116534.72	1143	153558.92	868
21	75870.31		116466.15	1132	153506.89	867
20	75851.36		116397.63	1142	153454.91	866
19	75832.40		116329.16	1141	153402.97	865
18	75813.43		116260.73	1140	153351.09	864
17	75794.46		116192.34	1139	153299.25	864
16	75775.48		116124.00	1139	153247.46	863
15	75756.50		116055.71	1138	153195.72	862
14	75737.51	317	115987.47	1137	153144.03	861
13	75718.51		115919.27	1136	153092.38	860
12	75699.51		115851.11	1136	153040.78	860
11	75680.49		115783.01	1135	152989.23	859
10	75661.48		115714.95	1134	152937.73	858
9	75642.45		115646.93	1133	152886.27	858
8	75623.42		115578.96	1133	152834.87	857
7	75604 39		115511.04	1132	152783.51	856
6	75585 35		115443.16	1131	152732.19	855
5	75566.30	318	115375.32	1130	152680.93	854
4	75547.24		115307.54	1129	152629.71	853
3	75528.18		115239.79	1129	152578.54	853
2	75509.11		115172.10	1128	152527.41	852
1	75490.04		115104.45	1127	152476.34	851
0	75470.96		115036.84	1126	152425.31	850

41. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
0	65605.90		86928.67		132501.30	
1	65627.85	366	86979.76	852	132534.82	559
2	65649.80		87030.87		132568.37	
3	65671.74		87082.00		132601.94	560
4	65693.67		87133.16	853	132635.54	
5	65715.60	365	87184.35		132669.18	561
6	65737.52		87235.56	854	132702.84	
7	65759.44		87286.80		132736.52	562
8	65781.35		87338.06	855	132770.24	
9	65803.26		87389.35		132803.99	563
10	65825.16		87440.67	856	132837.76	
11	65847.06		87492.01		132871.56	564
12	65868.95		87543.38		132905.39	
13	65890.83		87594.78	857	132939.25	565
14	65912.71		87646.20		132973.14	
15	65934.58	364	87697.65	858	133007.06	566
16	65956.45		87749.12		133041.00	
17	65978.31		87800.62	859	133074.97	
18	65000.17		87852.15		133108.98	567
19	66022.02		87903.70		133143.01	
20	66043.86		87955.28	860	133177.07	568
21	66065.70		88006.88		133211.15	
22	66087.54		88058.52	861	133245.27	569
23	66109.36		88110.17		133279.42	
24	66131.19		88161.86	862	133313.59	570
25	66153.00		88213.57		133347.79	
26	66174.81	363	88265.31	863	133382.02	571
27	66196.62		88317.07		133416.29	
28	66218.42		88368.86		133450.58	572
29	66240.22		88420.68	864	133484.89	
30	66262.00		88472.53		133519.24	573

48. Grad.

	Sinus	10''	Tangens.	10'	Secans.	10''
60	75470.96		115036.84		152425.31	
59	75451.87	318	114969.28	1126	152374.33	849
58	75432.78		114901.76	1125	152323.39	849
57	75413.68		114834.29	1124	152272.50	848
56	75394.57		114766.87	1123	152221.66	847
55	75375.46	319	114699.49	1123	152170.87	846
54	75356.34		114632.15	1122	152120.12	845
53	75337.21		114564.86	1121	152069.42	845
52	75318.08		114497.62	1120	152018.76	844
51	75298.94		114430.41	1120	151968.15	843
50	75279.80		114363.26	1119	151917.59	842
49	75260.65		114296.15	1118	151867.08	842
48	75241.49		114229.08	1117	151816.61	841
47	75222.33		114162.06	1117	151766.19	840
46	75203.16	320	114095.08	1116	151715.81	839
45	75183.98		114028.15	1115	151665.48	838
44	75164.80		113961.26	1115	151615.20	838
43	75145.61		113894.41	1114	151564.96	837
42	75126.41		113827.61	1113	151514.77	836
41	75107.21		113760.85	1112	151464.62	835
40	75088.00		113694.14	1112	151414.52	835
39	75068.79		113627.47	1111	151364.47	834
38	75049.57		113560.85	1110	151314.46	833
37	75030.34		113494.27	1109	151264.50	832
36	75011.11	321	113427.73	1108	151214.59	832
35	74991.87		113361.24	1107	151164.72	831
34	74972.62		113294.79	1107	151114.89	830
33	74953.37		113228.39	1106	151065.11	829
32	74934.11		113162.03	1105	151015.38	829
31	74914.84		113095.71	1104	150965.69	828
30	74895.57		113029.44	1104	150916.69	827

41. Grad.

	Sinus	10"	Tangens.	10"	Secans.	10"
30	66262.00		88472.53		133519.24	
31	66283.79	363	88524.40	865	133553.62	573
32	66305.57		88576.29		133588.02	574
33	66327.34		88628.22	856	133622.46	
34	66349.10		88680.17		133656.92	575
35	66370.87		88732.15	867	133691.41	
36	66392.62		88784.15		133725.94	576
37	66414.37	362	88836.19		133760.49	
38	66436.11		88888.24	868	133795.07	577
39	66457.85		88940.33		133829.68	
40	66479.59		88992.44	869	133864.32	578
41	66501.31		89044.58		133898.98	
42	66523.03		89096.75	870	133933.68	579
43	66544.75		89148.94		133968.41	
44	66566.46		89201.16	871	134003.16	580
45	66588.17		89253.41		134037.95	
46	66609.87		89305.69		134072.76	581
47	66631.56	361	89357.99	872	134107.61	
48	66653.25		89410.32		134142.48	582
49	66674.93		89462.68	873	134177.38	
50	66696.61		89515.06		134212.32	
51	66718.28		89567.47	874	134247.28	583
52	66739.94		89619.91		134282.27	
53	66761.60		89672.37	875	134317.29	584
54	66783.25		89724.87		134352.34	
55	66804.90		89777.39	876	134387.42	585
56	66326.55		89829.94		134422.53	
57	66848.18		89882.51	877	134457.67	586
58	66869.81	360	89935.12		134492.84	
59	66891.44		89987.75		134528.04	587
60	66913.06		90040.40	878	134563.27	

48. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
30	74895.57		113029.44		150916.69	
29	74876.29	321	112963.21	1104	150866.45	826
28	74857.01		112897.02	1103	150816.90	826
27	74837.72	322	112830.88	1102	150767.39	825
26	74818.42		112764.78	1101	150717.93	824
25	74799.12		112698.72	1100	150668.52	823
24	74779.81		112632.71	1100	150619.15	823
23	74760.49		112566.74	1099	150569.82	822
22	74741.17		112500.81	1098	150520.54	821
21	74721.84		112434.93	1097	150471.31	820
20	74702.51		112369.09	1097	150422.11	820
19	74683.17		112303.29	1096	150372.97	819
18	74663.82		112237.54	1096	150327.87	818
17	74644.46	323	112171.83	1095	150274.81	817
16	74625.10		112106.16	1094	150225.80	817
15	74605.74		112040.53	1093	150176.83	816
14	74586.36		111974.95	1093	150127.91	815
13	74566.98		111909.41	1092	150079.03	814
12	74547.60		111843.41	1091	150030.20	814
11	74528.21		111778.46	1091	149981.41	813
10	74508.81		111713.05	1090	149932.67	812
9	74489.41		111647.68	1089	149883.97	811
8	74469.99	324	111582.35	1088	149835.31	811
7	74450.58		111517.06	1088	149786.70	810
6	74431.15		111451.82	1087	149738.13	809
5	74411.72		111386.62	1086	149689.61	808
4	74392.29		111321.46	1086	149641.13	808
3	74372.85		111256.35	1085	149592.70	807
2	74353.40		111191.27	1084	149544.30	806
1	74333.94		111126.24	1084	149495.96	805
0	74314.48		111061.25	1083	149447.65	805

42. Grad.

	Sinus	10"	Tangens	10"	Secans	10"
0	66913.06		90040.40		134563.27	
1	66934.67	360	90093.09	878	134598.53	588
2	66956.28		90145.86	879	134633.82	
3	66977.89		90198.54		134669.14	589
4	66999.48		90251.31	880	134704.49	
5	67021.08		90304.11		134739.87	590
6	67042.66		90356.93	881	134775.28	
7	67064.24		90409.79		134810.72	591
8	67085.82		90462.66	882	134846.19	
9	67107.39	359	90515.57		134881.68	592
10	67128,95		90568.51	883	134917.21	
11	67150.51		90621.47		134952.77	593
12	67172.06		90674.46		134988.36	
13	67193.60		90727.48	884	135023.98	494
14	67215.15		90780.53		135059.63	
15	67236.68		90833.60	885	135095.31	595
16	67258.21		90886.71		135131.02	
17	67279.73		90939.84	886	135166.7[illegible]	596
18	67301.25		90993.00		135202.54	
19	67322.76	358	91046.19	887	135238.34	597
20	67344.27		91099.40		135274.17	
21	67366.77		91152.65	888	135310.03	598
22	67387.27		91205.92		135345.93	
23	67409.75		91259.22	889	135381.85	599
24	67430.24		91312.55		135417.80	
25	67451.72		91365.90	890	135453.79	600
26	67473.19		91419.29		135489.86	
27	67494.65		91472.70		135525.85	601
28	67516.12		91526.15	891	135561.92	602
29	67537.57		91579 62		135598.03	
30	67559.02	357	91633.12	892	135634.17	603

47. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	74314.48		111061.25		149447.65	
59	74295.01	324	110996.30	1082	149399.40	804
58	74275.54	325	110931.40	1081	149351.18	803
57	74256.06		110866.53	1081	149303.01	803
56	74236.57		110801.71	1080	149254.88	802
55	74217.08		110736.93	1079	149206.80	801
54	74197.58		110672.19	1079	149158.75	800
53	74178.08		110607.50	1078	149110.76	800
52	74158.57		110542.84	1077	149062.80	799
51	74139.05		110478.23	1077	149014.89	798
50	74119.53		110413.65	1076	148967.03	797
49	74100.00	326	110349.12	1075	148919.20	797
48	74080.46		110284.63	1075	148871.42	796
47	74060.92		110220.19	1074	148823.69	795
46	74041.37		110155.78	1073	148775.99	795
45	74021.81		110091.41	1072	148728.34	794
44	74002.25		110027.09	1072	148680.73	793
43	73982.68		109962.81	1071	148633.17	792
42	73963.11		109898.56	1070	148585.65	792
41	73943.53		109834.36	1069	148538.17	791
40	73923.94		109770.20	1069	148490.73	790
39	73904.35	327	109706.08	1068	148443.34	790
38	73884.75		109642.01	1068	148395.99	789
37	73865.15		109577.97	1067	148348.68	788
36	73845.53		109513.97	1066	148301.42	787
35	73825.92		109450.02	1066	148254.20	787
34	73806.29		109386.10	1065	148207.02	786
33	73786.66		109322.23	1064	148157.88	785
32	73767.02		109258.40	1064	148112.78	785
31	73747.38		109194.60	1033	148065.73	784
30	73727.73	328	109130.85	1062	148018.72	783

42. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	67559.02		91633.12		135634.17	
31	67580.46	357	91686.64	892	135670.34	603
32	67601.90		91740.20	893	135706.54	604
33	67623.33		91793.79		135742.77	
34	67644.76		91847.40	894	135779.03	605
35	67666.18		91901.04		135815.32	
36	67687.60		91954.71	895	135851.64	606
37	67709.01		92008.41		135888 00	
38	67730.41		92062.14	896	135924.38	607
39	67751.81		92115.90		135960.80	
40	67773.20	356	92169.68	897	135997.25	608
41	67794.59		92223.50		136033.73	
42	67815.97		92277.34	898	136070.23	609
43	67837.34		92331.22		136106.77	
44	67858.71		92385.12	899	136143.34	610
45	67880.07		92439.05		136179.95	
46	67901.43		92493.10	900	136216.58	611
47	67922.78		92547.00		136253.24	
48	67944.13		92601.01	901	136289.94	612
49	67965.47		92655.06		136326.67	
50	67986.81		92709.14	902	136363.43	613
51	68008.13	355	92763.24		136400.22	
52	68029.46		92817.38	903	136437.04	614
53	68050.77		92871.54		136473.89	615
54	68072.09		92925.73		136510.78	
55	68093.39		92979.96	904	136547.70	616
56	68144.69		93034.21		136584.64	
57	68135.99		93088.49	905	136621.62	617
58	68157.28		93142.80		136658.63	
59	68178.56		93197.14	906	136695.67	618
60	68199.84		93251.51		136732.75	

47. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	73727.73		109130.85		148018.72	
29	73708.08	328	109067.14	1062	147971.76	782
28	73688.42		109003.47	1061	147924.83	782
27	73668.75		108939.83	1060	147877.95	781
26	73649.07		108876.24	1060	147831.11	780
25	73629.39		108812.69	1059	147784.31	780
24	73609.71		108749.18	1058	147737.55	779
23	73590.02		108685.71	1058	147690.84	778
22	73570.32		108622.28	1057	147644.17	778
21	73550.61		108558.89	1056	147597.54	777
20	73530.90	329	108495.54	1056	147550.95	776
19	73511.18		108432.23	1055	147504.40	775
18	73491.46		108368.96	1054	147457.90	775
17	73471.73		108305.73	1054	147411.44	774
16	73451.99		108242.54	1053	147365.01	773
15	73432.25		108179.39	1052	147318.64	773
14	73412.50		108116.28	1052	147272.30	772
13	73392.75		108053.21	1051	147226.00	771
12	73372.99		107990.18	1050	147179.75	771
11	73353.22		107927.18	1050	147133.53	770
10	73333.45	330	107864.23	1049	147087.36	769
9	73313.67		107801.32	1048	147041.23	769
8	73293.88		107738.44	1048	146995.14	768
7	73274.09		107675.61	1047	146949.10	767
6	73254.29		107612.82	1046	146903.09	766
5	73234.48		107550.06	1046	146857.13	766
4	73214.67		107487.34	1045	146811.20	765
3	73194.86		107424.67	1044	146765.32	764
2	73175.03		107362.03	1044	146719.48	764
1	73155.21	331	107299.43	1043	146673.68	763
0	73135.37		107236.87	1042	146627.92	762

40. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	64944.80		85408.07		131508.70	
31	64966.92	369	85458.39	839	131541.33	545
32	64988.03	368	85508.73		131574.10	
33	65011.14		85559.10	840	131606.84	546
34	65033.24		85609.50		131639.61	
35	65055.33		85659.92	841	131672.40	547
36	65077.42		85710.37		131705.23	
37	65099.50		85760.84		131738.08	548
38	65121.58		85811.33	842	131770.96	
39	65143.66		85861.85		131803.86	549
40	65165.72		85912.40	843	131836.79	
41	65187.78		85962.97		131869.76	550
42	65209.84		86013.57	844	131902.74	
43	65231.89	367	86064.19		131935.76	551
44	65253.94		86114.84		131968.80	
45	65275.97		86165.51	845	132001.88	
46	65298.01		86216.21		132034.98	552
47	65320.04		86266.93	846	132068.10	
48	65342.06		86317.68		132101.26	553
49	65364.08		86368.46		132134.44	
50	65386.09		86419.26	847	132167.65	554
51	65408.10		86470.09		132200.89	
52	65430.10		86520.94	848	132234.16	555
53	65452.09		86571.81		132267.45	
54	65474.08	366	86622.72	849	132300.77	556
55	65496.06		86673.65		132334.13	
56	65518.04		86724.60		132367.50	557
57	65540.02		86775.58	850	132391.91	
58	65561.98		86826.58		132434.35	558
59	65583.95		86877.62	851	132467.81	
60	65605.90		86928.67		132501.30	

49. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	76040.60		117084.96		153976.90	
29	76021.79	315	117016.01	1149	153924.49	873
28	76002.80		116947.12	1148	153872.12	872
27	75983.89		116878 27	1147	153819.80	872
26	75964.98		116809.47	1146	153767.52	871
25	75946.06		116740.71	1146	153715.30	870
24	75927.13		116672.00	1145	153663.12	869
23	75908.20	316	116603.34	1144	153611.00	868
22	75889.26		116534.72	1143	153558.92	868
21	75870.31		116466.15	1132	153506.89	867
20	75851.36		116397.63	1142	153454.91	866
19	75832.40		116329.16	1141	153402.97	865
18	75813.43		116260.73	1140	153351.09	864
17	75794.46		116192.34	1139	153299.25	864
16	75775.48		116124.00	1139	153247.46	863
15	75756.50		116055.71	1138	153195.72	862
14	75737.51	317	115987.47	1137	153144.03	861
13	75718.51		115919.27	1136	153092.38	860
12	75699.51		115851.11	1136	153040.78	860
11	75680.49		115783.01	1135	152989.23	859
10	75661.48		115714.95	1134	152937.73	858
9	75642.45		115646.93	1133	152886.27	858
8	75623.42		115578.96	1133	152834.87	857
7	75604 39		115511.04	1132	152783.51	856
6	75585 35		115443.16	1131	152732.19	855
5	75566.30	318	115375.32	1130	152680.93	854
4	75547.24		115307.54	1129	152629.71	853
3	75528.18		115239.79	1129	152578.54	853
2	75509.11		115172.10	1128	152527.41	852
1	75490.04		115104.45	1127	152476.34	851
0	75470.96		115036.84	1126	152425.31	850

41. Grad.

	Sinus	10″	Tangens.	10″	Secans.	10″
0	65605.90		86928.67		132501.30	
1	65027.85	366	86979.76	852	132534.82	559
2	65649.80		87030.87		132568.37	
3	65671.74		87082.00		132601.94	560
4	65693.67		87133.16	853	132635.54	
5	65715.60	365	87184.35		132669.18	561
6	65737.52		87235.56	854	132702.84	
7	65759.44		87286.80		132736.52	562
8	65781.35		87338.06	855	132770.24	
9	65803.26		87389.35		132803.99	563
10	65825.16		87440.67	856	132837.76	
11	65847.66		87492.01		132871.56	564
12	65868.95		87543.38		132905.39	
13	65890.83		87594.78	857	132939.25	565
14	65912.71		87646.20		132973.14	
15	65934.58	364	87697.65	858	133007.06	566
16	65956.45		87749.12		133041.00	
17	65978.31		87800.62	859	133074.97	
18	65000.17		87852.15		133108.98	567
19	66022.02		87903.70		133143.01	
20	66043.86		87955.28	860	133177.07	568
21	66065.70		88006.88		133211.15	
22	66087.54		88058.52	861	133245.27	569
23	66109.36		88110.17		133279.42	
24	66131.19		88161.86	862	133313.59	570
25	66153.00		88213.57		133347.79	
26	66174.81	363	88265.31	863	133382.02	571
27	66196.62		88317.07		133416.29	
28	66218.42		88368.86		133450.58	572
29	66240.22		88420.68	864	133484.89	
30	66262.00		88472.53		133519.24	573

48. Grad.

	Sinus	10''	Tangens.	10	Secans.	10''
60	75470.96		115036.84		152425.31	
59	75451.87	318	114969.28	1126	152374.33	849
58	75432.78		114901.76	1125	152323.39	849
57	75413.68		114834.29	1124	152272.50	848
56	75394.57		114766.87	1123	152221.66	847
55	75375.46	319	114699.49	1123	152170.87	846
54	75356.34		114632.15	1122	152120.12	845
53	75337.21		114564.86	1121	152069.42	845
52	75318.08		114497.62	1120	152018.76	844
51	75298.94		114430.41	1120	151968.15	843
50	75279.80		114363.26	1119	151917.59	842
49	75260.65		114296.15	1118	151867.08	842
48	75241.49		114229.08	1117	151816.61	841
47	75222.33		114162.06	1117	151766.19	840
46	75203.16	320	114095.08	1116	151715.81	839
45	75183.98		114028.15	1115	151665.48	838
44	75164.80		113961.26	1115	151615.20	838
43	75145.61		113894.41	1114	151564.96	837
42	75126.41		113827.61	1113	151514.77	836
41	75107.21		113760.85	1112	151464.62	835
40	75088.00		113694.14	1112	151414.52	835
39	75068.79		113627.47	1111	151364.47	834
38	75049.57		113560.85	1110	151314.46	833
37	75030.34		113494.27	1109	151264.50	832
36	75011.11	321	113427.73	1108	151214.59	832
35	74991.87		113361.24	1107	151164.72	831
34	74972.62		113294.79	1107	151114.89	830
33	74953.37		113228.39	1106	151065.11	829
32	74934.11		113162.03	1105	151015.38	829
31	74914.84		113095.71	1104	150965.69	828
30	74895.57		113029.44	1104	150916.69	827

41. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	66262.00		88472.53		133519.24	
31	66283.79	363	88524.40	865	133553.62	573
32	66305.57		88576.29		133588.02	574
33	66327.34		88628.22	856	133622.46	
34	66349.10		88680.17		133656.92	575
35	66370.87		88732.15	867	133691.41	
36	66392.62		88784.15		133725.94	576
37	66414.37	362	88836.19		133760.49	
38	66436.11		88888.24	868	133795.07	577
39	66457.85		88940.33		133829.68	
40	66479.59		88992.44	869	133864.32	578
41	66501.31		89044.58		133898.98	
42	66523.03		89096.75	870	133933.68	579
43	66544.75		89148.94		133968.41	
44	66566.46		89201.16	871	134003.16	580
45	66588.17		89253.41		134037.95	
46	66609.87		89305.69		134072.76	581
47	66631.56	361	89357.99	872	134107.61	
48	66653.25		89410.32		134142.48	582
49	66674.93		89462.68	873	134177.38	
50	66696.61		89515.06		134212.32	
51	66718.28		89567.47	874	134247.28	583
52	66739.94		89619.91		134282.27	
53	66761.60		89672.37	875	134317.29	584
54	66783.25		89724.87		134352.34	
55	66804.90		89777.39	876	134387.42	585
56	66826.55		89829.94		134422.53	
57	66848.18		89882.51	877	134457.67	586
58	66869.81	360	89935.12		134492.84	
59	66891.44		89987.75		134528.04	587
60	66913.06		90040.40	878	134563.27	

48. Grad.

	Sinus	10″	*Tangens.*	10″	*Secans.*	10″
30	74895.57		113029.44		150916.69	
29	74876.29	321	112963.21	1104	150866.45	826
28	74857.01		112897.02	1103	150816.90	826
27	74837.72	322	112830.88	1102	150767.39	825
26	74818.42		112764.78	1101	150717.93	824
25	74799.12		112698.72	1100	150668.52	823
24	74779.81		112632.71	1100	150619.15	823
23	74760.49		112566.74	1099	150569.82	822
22	74741.17		112500.81	1098	150520.54	821
21	74721.84		112434.93	1097	150471.31	820
20	74702.51		112369.09	1097	150422.11	820
19	74683.17		112303.29	1096	150372.97	819
18	74663.82		112237.54	1096	150327.87	818
17	74644.46	323	112171.83	1095	150274.81	817
16	74625.10		112106.16	1094	150225.80	817
15	74605.74		112040.53	1093	150176.83	816
14	74586.36		111974.95	1093	150127.91	815
13	74566.98		111909.41	1092	150079.03	814
12	74547.60		111843.41	1091	150030.20	814
11	74528.21		111778.46	1091	149981.41	813
10	74508.81		111713.05	1090	149932.67	812
9	74489.41		111647.68	1089	149883.97	811
8	74469.99	324	111582.35	1088	149835.31	811
7	74450.58		111517.06	1088	149786.70	810
6	74431.15		111451.82	1087	149738.13	809
5	74411.72		111386.62	1086	149689.61	808
4	74392.29		111321.46	1086	149641.13	808
3	74372.85		111256.35	1085	149592.70	807
2	74353.40		111191.27	1084	149544.30	806
1	74333.94		111126.24	1084	149495.96	805
0	74314.48		111061.25	1083	149447.65	805

47. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	74314.48		111061.25		149447.65	
59	74295.01	324	110996.30	1082	149399.40	804
58	74275.54	325	110931.40	1081	149351.18	803
57	74256.06		110866.53	1081	149303.01	803
56	74236.57		110801.71	1080	149254.88	802
55	74217.08		110736.93	1079	149206.80	801
54	74197.58		110672.19	1079	149158.75	800
53	74178.08		110607.50	1078	149110.76	800
52	74158.57		110542.84	1077	149062.80	799
51	74139.05		110478.23	1077	149014.89	798
50	74119.53		110413.65	1076	148967.03	797
49	74100.00	326	110349.12	1075	148919.20	797
48	74080.46		110284.63	1075	148871.42	796
47	74060.92		110220.19	1074	148823.69	795
46	74041.37		110155.78	1073	148775.99	795
45	74021.81		110091.41	1072	148728.34	794
44	74002.25		110027.09	1072	148680.73	793
43	73982.68		109962.81	1071	148633.17	792
42	73963.11		109898.56	1070	148585.65	792
41	73943.53		109834.36	1069	148538.17	791
40	73923.94		109770.20	1069	148490.73	790
39	73904.35	327	109706.08	1068	148443.34	790
38	73884.75		109642.01	1068	148395.99	789
37	73865.15		109577.97	1067	148348.68	788
36	73845.53		109513.97	1066	148301.42	787
35	73825.92		109450.02	1066	148254.20	787
34	73806.29		109386.10	1065	148207.02	786
33	73786.66		109322.23	1064	148157.88	785
32	73767.02		109258.40	1064	148112.78	785
31	73747.38		109194.60	1033	148065.73	784
30	73727.73	328	109130.85	1062	148018.72	783

42. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	67559.02		91633.12		135634.17	
31	67580.46	357	91686.64	892	135670.34	603
32	67601.90		91740.20	893	135706.54	604
33	67623.33		91793.79		135742.77	
34	67644.76		91847.40	894	135779.03	605
35	67666.18		91901.04		135815.32	
36	67687.60		91954.71	895	135851.64	606
37	67709.01		92008.41		135888 00	
38	67730.41		92062.14	896	135924.38	607
39	67751.81		92115.90		135960.80	
40	67773.20	356	92169.68	897	135997.25	608
41	67794.59		92223.50		136033.73	
42	67815.97		92277.34	898	136070.23	609
43	67837.34		92331.22		136106.77	
44	67858.71		92385.12	899	136143.34	610
45	67880.07		92439.05		136179.95	
46	67901.43		92493.10	900	136216.58	611
47	67922.78		92547.00		136253.24	
48	67944.13		92601.01	901	136289.94	612
49	67965.47		92655.06		136326.67	
50	67986.81		92709.14	902	136363.43	613
51	68008.13	355	92763.24		136400.22	
52	68029.46		92817.38	903	136437.04	614
53	68050.77		92871.54		136473.89	615
54	68072.09		92925.73		136510.78	
55	68093.39		92979.96	904	136547.70	616
56	68144.69		93034.21		136584.64	
57	68135.99		93088.49	905	136621.62	617
58	68157.28		93142.80		136658.63	
59	68178.56		93197.14	906	136695.67	618
60	68199.84		93251.51		136732.75	

47. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
30	73727.73		109130.85		148018.72	
29	73708.08	328	109067.14	1062	147971.76	782
28	73688.42		109003.47	1061	147924.83	782
27	73668.75		108939.83	1060	147877.95	781
26	73649.07		108876.24	1060	147831.11	780
25	73629.39		108812.69	1059	147784.31	780
24	73609.71		108749.18	1058	147737.55	779
23	73590.02		108685.71	1058	147690.84	778
22	73570.32		108622.28	1057	147644.17	778
21	73550.61		108558.89	1056	147597.54	777
20	73530.90	329	108495.54	1056	147550.95	776
19	73511.18		108432.23	1055	147504.40	775
18	73491.46		108368.96	1054	147457.90	775
17	73471.73		108305.73	1054	147411.44	774
16	73451.99		108242.54	1053	147365.01	773
15	73432.25		108179.39	1052	147318.64	773
14	73412.50		108116.28	1052	147272.30	772
13	73392.75		108053.21	1051	147226.00	771
12	73372.99		107990.18	1050	147179.75	771
11	73353.22		107927.18	1050	147133.53	770
10	73333.45	330	107864.23	1049	147087.36	769
9	73313.67		107801.32	1048	147041.23	769
8	73293.88		107738.44	1048	146995.14	768
7	73274.09		107675.61	1047	146949.10	767
6	73254.29		107612.82	1046	146903.09	766
5	73234.48		107550.06	1046	146857.13	766
4	73214.67		107487.34	1045	146811.20	765
3	73194.86		107424.67	1044	146765.32	764
2	73175.03		107362.03	1044	146719.48	764
1	73155.21	331	107299.43	1043	146673.68	763
0	73135.37		107236.87	1042	146627.92	762

43. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	68199.84		93251.51		136732.75	
1	68221.00	354	93305.91	907	136769.85	619
2	68242.37		93360.34		136806.99	
3	68263.63		93414.79	908	136844.16	620
4	68284.89		93469.28		136881.36	
5	68306.13		93523.80	909	136918.59	621
6	68327.38		93578.34		136955.86	
7	68348.61		93632.92	910	136993.15	622
8	68369.84		93687.53		137030.48	
9	68391.07		93742.16	911	137067.84	623
10	68412.29	353	93796.83		137105.23	624
11	68433.50		93851.52	912	137142.66	
12	68454.71		93906.25		137180.11	625
13	68475.91		93961.01	913	137217.60	
14	68497.11		94015.79		137255.12	626
15	68518.30		94070.61	914	137292.68	
16	68539.48		94125.45		137330.26	627
17	68560.66		94180.33	915	137367.88	
18	68581.83		94235.23		137405.53	628
19	68603.00		94290.17	916	137443.21	
20	68624.16		94345.13		137480.92	629
21	68645.32		94400.13	917	137518.67	
22	68666.47	352	94455.16		137556.45	630
23	68687.61		94510.21	918	137594.26	
24	68708.75		94565.30		137632.10	631
25	68729.88		94620.42	919	137669.98	632
26	68751.10		94675.56		137707.89	
27	68772.13		94730.74	920	137745.83	633
28	68793.24		94785.95		137783.80	
29	68814.35		94841.19	921	137821.81	634
30	68835.46		94896.46		137859.85	

46. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
60	73135.37		107236.87		146627.92	
59	73115.53	331	107174.35	1042	146582.20	762
58	73095.68		107111.87	1041	146536.52	761
57	73075.83		107049.43	1040	146490.88	760
56	73055.97		106987.02	1040	146445.29	760
55	73036.10		106924.66	1039	146399.73	759
54	73016.23		106862.33	1038	146354.22	758
53	72996.35		106800.04	1038	146308.75	758
52	72976.46		106737.79	1037	146263.31	757
51	72956.57	332	106675.58	1037	146217.92	757
50	72936.68		106613.41	1036	146172.57	756
49	72916.77		106551.28	1035	146127.26	755
48	72896.86		106489.18	1035	146081.98	754
47	72876.95		106427.13	1034	146036.75	754
46	72857.02		106365.11	1033	145991.56	753
45	72837.10		106303.13	1033	145946.41	752
44	72817.16		106241.19	1032	145901.30	752
43	72797.22		106179.29	1031	145856.23	751
42	72777.28		106117.42	1031	145811.20	750
41	72757.32	333	106055.60	1030	145766.21	750
40	72737.36		105993.81	1030	145721.27	749
39	72717.40		105932.06	1029	145672.36	748
38	72697.43		105870.34	1028	145631.49	748
37	72677.45		105808.67	1028	145586.66	747
36	72657 47		105747.03	1027	145541.87	746
35	72637.48		105685.44	1026	145497.12	746
34	72617.48		105623.88	1026	145422.41	745
33	72597.48		105562.35	1025	145407.74	744
32	72577.47	334	105500.87	1024	145363.11	744
31	72557.46		105439.42	1024	145318.52	743
30	72537.44		105378.01	1023	145273.97	742

46. Grad.

	Sinus	10″	*Tangens*	10″	*Secans*	10″
30	72537.44		105378.01		145273.97	
29	72517.41	334	105316.64	1023	145229.46	742
28	72497.38		105255.31	1022	145184.98	741
27	72477.34		105194.01	1021	145140.55	740
26	72457.29		105132.75	1020	145096.16	740
25	72437.24		105071.53	1020	145051.80	739
24	72417.19		105010.34	1019	145007.49	738
23	72397.12		104949.20	1019	144963.22	738
22	72377.05	335	104888.09	1018	144918.98	737
21	72356.98		104827.02	1018	144874.78	736
20	72336.90		104765.98	1017	144830.63	736
19	72316.81		104704.98	1016	144786.51	735
18	72296.71		104644.02	1016	144742.43	734
17	72276.61		104583.10	1015	144698.39	734
16	72256.51		104522.21	1015	144654.39	733
15	72236.40		104461.36	1014	144610.43	732
14	72216.28		104400.55	1013	144566.51	732
13	72196.15		104339.77	1013	144522.62	731
12	72176.02	336	104279.04	1012	144478.78	730
11	72155.89		104218.33	1011	144434.97	730
10	72135.74		104157.67	1011	144391.20	729
9	72115.59		104097.04	1010	144347.48	729
8	72095.44		104036.45	1010	144303.79	728
7	72075.28		103975.89	1009	144260.13	727
6	72055.11		103915.37	1008	144216.52	727
5	72034.94		103854.89	1008	144172.95	726
4	72014.76		103794.45	1007	144129.41	725
3	71994.57		103734.04	1007	144085.91	725
2	71974.38	337	103673.67	1006	144042.46	724
1	71954.18		103613.33	1005	143999.04	723
0	71938.98		103553.03	1005	143955.65	723

44. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
0	69465.84		96568.88		139016.36	
1	69486.76	349	96625.11	937	139055.43	651
2	69507.67		96681.37	938	139094.53	652
3	69528.58	348	96737.67		139133.66	653
4	69549.49		96793.99	939	139172.83	
5	69570.39		96850.35	940	139214.03	654
6	69591.28		96906.74		139251.27	
7	69612.17		96963.16	941	139290.54	655
8	69633.05		97019.62		139329.85	
9	69653.92		97076.10	942	139369.18	656
10	69674.79		97132.62		139408.56	657
11	69695.65		97189.17	943	139447.96	
12	69716.51		97245.75		139487.40	658
13	69737.36	347	97302.36	944	139526.88	
14	69758.21		97359.01		139566.39	659
15	69779.05		97415.69	945	139605.93	
16	69799.88		97472.40		139645.51	660
17	69820.71		97529.14	946	139685.12	661
18	69841.53		97585.91	947	139724.77	
19	69862.34		97642.72		139764.45	662
20	69883.15		97699.56	948	139804.16	
21	69903.96		97756.43		139843.91	663
22	69924.75	346	97813.33	949	139883.69	
23	69945.55		97870.27		139923.51	664
24	69966.33		97927.23	950	139963.36	665
25	69987.11		97984.24		140003.25	
26	70007.89		98041.27	951	140034.17	666
27	70028.66		98098.33		140083.13	
28	70049.42		98155.43	952	140123.12	667
29	70070.18		98212.56		140163.15	
30	70090.93		98269.73	953	140203.21	668

45. Grad.

	Sinus	10″	Tangens	10″	Secans	10″
60	71938.98		103553.03		143955.65	
59	71913.77	337	103492.77	1004	143912.31	722
58	71893.55		103432.54	1003	143869.00	721
57	71873.33		103372.35	1003	143852.74	721
56	71853.10		103312.20	1002	143782.51	720
55	71832.87		103252.08	1002	143739.32	720
54	71812.63		103191.99	1001	143696.16	719
53	71792.38		103131.95	1001	143653.05	718
52	71772.13	338	103071.94	1000	143609.97	718
51	71751.87		103011.96	999	143566.93	717
50	71731.61		102952.03	999	143523.93	716
49	71711.34		102892.12	998	143480.97	716
48	71691.06		102832.26	998	143438.05	715
47	71670.78		102772.42	997	143395.16	715
46	71650.49		102712.63	996	143352.31	714
45	71630.19		102652.87	996	143309.50	713
44	71609.89		102593.15	995	143266.72	713
43	71580.59		102533.46	995	143223.99	712
42	71569.27	339	102473.81	694	143181.29	711
41	71548.95		102414.19	993	143138.63	711
40	71528.63		102354.61	993	143096.00	710
39	71508.30		102295.06	992	143053.42	710
38	71487.96		102235.55	992	143010.87	709
37	71467.62		102176.08	991	142968.36	708
36	71447.27		102116.64	990	142925.88	708
35	71426.91		102057.23	990	142883.44	707
34	71406.55		101997.86	989	142871.05	706
33	71386.18		101938.53	989	142798.68	706
32	71365.81	340	101879.23	988	142756.36	705
31	71345.43		101819.97	987	142714.07	705
30	71325.04		101760.74	987	142671.82	704

44. Grad.

	Sinus	10"	*Tangens.*	10"	*Secans.*	10"
30	70090.93		98269.73		140203.21	
31	70111.67	346	98326.92	954	140243.30	669
32	70132.41		98384.15		140283.43	
33	70153.14	345	98441.41	955	140323.60	670
34	70173.87		98498.71		140363.80	
35	70194.59		98556.03	956	140404.03	671
36	70215.30		98613.39		140444.30	
37	70236.01		98670.79	957	140484.60	672
38	70256.72		98728.21		140524.94	673
39	70277.41		98785.67	958	140565.32	
40	70298.11		98843.16	959	140605.73	674
41	70318.79		98900.69		140646.17	
42	70339.47		98958.25	960	140686.65	675
43	70360.14	344	99015.84		140727.17	676
44	70380.81		99073.46	961	140767.72	
45	70401.47		99131.12		140808.31	677
46	70422.13		99188.81	962	140848.93	
47	70442.78		99246 54		140889.58	678
48	70463.42		99304.29	963	140930.28	679
49	70484.06		99362.08		140971.00	
50	70504.69		99419.91	964	141011.77	680
51	70525.32		99477.77	965	141052.56	
52	70545.94		99535.66		141093.40	681
53	70566.55	343	99593.58	966	141134.27	
54	70587.16		99651.54		141175.17	682
55	70607.76		99709.53	967	141216.11	683
56	70628.35		99767.56		141257.09	
57	70648.94		99825.62	968	141298.10	684
58	70669.53		99883.71		141339.15	
59	70690.11		99941.84	969	141380.24	685
60	70710.68		100000.00		141421.36	

45. Grad.

	Sinus	10''	*Tangens.*	10''	*Secans.*	10''
30	71325.04		101760.74		142671.82	
29	71304.65	340	101701.55	986	142629,61	703
28	71284.26		101642.39	986	142587.43	703
27	71263.85		101583.26	985	142545.29	702
26	71243.44		101524.17	985	142503.19	701
25	71223.03		101465.12	984	142461.12	701
24	71202.60		101406.10	983	142419.09	700
23	71182.18		101347.12	983	142377.10	790
22	71161.74	341	101288,17	982	142335.14	699
21	71141.30		101229.25	982	142293.23	698
20	71120.86		101170.37	981	142251.34	698
19	71100.40		101111.53	981	142209.50	697
18	71079.95		101052.72	980	142167.69	697
17	71059.48		100993.94	979	142125.92	696
16	71039.01		100935.20	979	142084.18	695
15	71018.54		100876.49	978	142042.48	695
14	70998.06		100817.82	978	142000.82	694
13	70977.57		100759.18	977	141959.19	694
12	70957.07	342	100700.58	976	141917.61	693
11	70936.57		100642.01	976	141876.05	692
10	70916.07		100583.47	975	141834.54	692
9	70895.56		100524.97	975	141793.05	691
8	70875.04		100466.51	974	141751.61	690
7	70854.51		100408.07	974	141710.20	690
6	70833.98		100349.68	973	141668 83	689
5	70813.45		100291.31	972	141627.49	689
4	70792.91		100232.98	972	141586.19	688
3	70772.36		100174.69	971	141544.93	687
2	70751.80	343	100116.42	971	141503.70	687
1	70731.24		100058.19	970	141462,91	686
0	70710.68		100000,00	970	141421,36	686

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